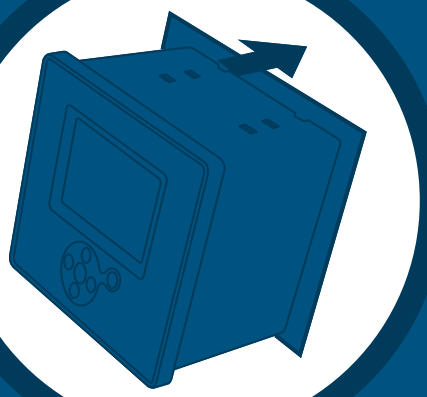
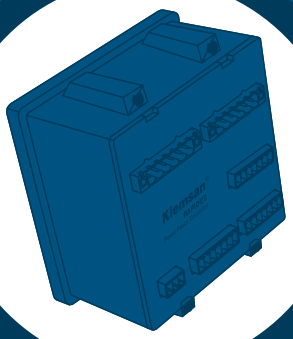
RAPIDUS

Power Factor Controller





USER MANUAL

Klemsan®

TABLE OF CONTENTS

SECTION 1 GENERAL INFORMATION 10

1.1 Symbols 10
1.2 General Warnings 10
1.3 Receipt Control and Contents of the Delivery 11
1.4 RAPIDUS Reactive Power Control Relay 11
1.5 RAPIDUS Front Panel 13

SECTION 2 INSTALLATION 15

2.1 Preparation for Installation 15
2.2 Placing on the panel 15
2.3 Wiring Diagrams 18
2.4 Dimensions 18

SECTION 3 MENUS 20

3.1 “First Power-on” Settings 20
3.1.1 Dil / Lang. / Язык Setting 20
3.1.2 Date 21
3.1.3 Time 22
3.1.4 Current Transformer Ratio (CTR) 22
3.1.5 Voltage Transformer Ratio (VTR) 24
3.1.6 Step number 24
3.1.7 Restart 25
3.2 Startup Screen 25
3.2.1 Settings 26
3.2.1.1 Quick setup Menu 27
3.2.1.1.1 Language Setting 27
3.2.1.1.2 Date Menu 27
3.2.1.1.3 Time Menu 27
3.2.1.1.4 CTR 27
3.2.1.1.5 VTR 27
3.2.1.1.6 Step number 27
3.2.1.2 Setup Menu 28
3.2.1.2.1 Network Menu 29
3.2.1.2.1.1 CTR Setting 29
3.2.1.2.1.2 VTR Setting 30
3.2.1.2.1.3 Demand period setting 30
3.2.1.2.2 Step Menu 31
3.2.1.2.2.1 Ent. Power Menu 31
3.2.1.2.2.2 Ent. Type Menu 31
3.2.1.2.2.3 Predefined Menu 32
3.2.1.2.2.3.1 Structure Menu 33
3.2.1.2.2.3.2 Power Menu 33
3.2.1.2.2.3.3 Number Menu 33
3.2.1.2.2.4 Other Menu 34
3.2.1.2.3 Compensation Menu 34

3.2.1.2.3.1 Steps Menu 34
3.2.1.2.3.2 Program Menu 35
3.2.1.2.3.2.1 Rapidus Program 36
3.2.1.2.3.2.2 Ascending Sequential program 36
3.2.1.2.3.2.3 Descending Sequential Mode 38
3.2.1.2.3.2.4 Linear Mode 40
3.2.1.2.3.2.5 Circular Mode 42
3.2.1.2.3.2.6 Manual program 44
3.2.1.2.3.3 Target 1 Inductive Menu 44
3.2.1.2.3.4 Target 1 Capacitive Menu 44
3.2.1.2.3.5 Target 2 Inductive Menu 44
3.2.1.2.3.6 Target 2 Capacitive Menu 45
3.2.1.2.3.7 Activation Time Menu 45
3.2.1.2.3.8 Deactivation Time Menu 45
3.2.1.2.3.9 Shift Angle Menu 45
3.2.1.2.3.10 Averaging Time 46
3.2.1.2.3.11 Fixed Steps Menu 46
3.2.1.2.4 Learn Menu 46
3.2.1.2.4.1 Learn Conn. Menu 46
3.2.1.2.4.1.1 Learn at start 47
3.2.1.2.4.1.2 Step number 48
3.2.1.2.4.1.3 Retry Timer 48
3.2.1.2.4.1.4 Retry Number 49
3.2.1.2.4.2 Aux. Input Menu 49
3.2.1.2.4.3 Off mode 50
3.2.1.2.4.4 Night/Day Mode 50
3.2.1.2.4.5 Generator Mode 50
3.2.1.2.5 Device Menu 50
3.2.1.2.5.1 Language Setting 51
3.2.1.2.5.2 Contrast Setting 51
3.2.1.2.5.3 Pass. Protection 51
3.2.1.2.5.4 New Password Setting 52
3.2.1.2.5.5 Display On Setting 52
3.2.1.2.5.6 Display On Time Setting 52
3.2.1.2.6 Energy Menu 53
3.2.1.2.6.1 Start of day setting 53
3.2.1.2.6.2 Start of month setting 53
3.2.1.2.6.3 kWh Setting 53
3.2.1.2.6.4 kWh E. Setting 53
3.2.1.2.6.5 kVArh I. Setting 54
3.2.1.2.6.6 kVArh C. Setting 54
3.2.1.2.7 Communication Menu 54
3.2.1.2.7.1 Baud Rate Menu 54
3.2.1.2.7.2 Slave Id Menu 54
3.2.1.2.8 Alarm Menu 55
3.2.1.2.8.1 Energy Alarm Menu 55

3.2.1.2.8.2 V(L-N) Alarm Menu....56
3.2.1.2.8.3 V(L-L) Alarm Menu....58
3.2.1.2.8.4 Current Alarm Menu....58
3.2.1.2.8.5 P Alarm Menu....58
3.2.1.2.8.6 Q Alarm Menu....58
3.2.1.2.8.7 S Alarm Menu....58
3.2.1.2.8.8 CosØ Alarm Menu....58
3.2.1.2.8.9 PF Alarm Menu....58
3.2.1.2.8.10 Step Alarm Menu....58
3.2.1.2.8.11 IN Alarm Menu....59
3.2.1.2.8.12 F Alarm Menu....59
3.2.1.2.8.13 V Harmonics Alarm Menu....59
3.2.1.2.8.14 I Harmonics Alarm Menu....60
3.2.1.2.8.15 Temperature Alarm Menu....60
3.2.1.2.9 Clear Menu....61
3.2.1.3 Date/Time Menu....63
3.2.1.4 System Info Menu....63
3.2.1.5 Password Menu....64
3.2.1.6 Restart Menu....64
3.2.1.7 Default Settings....65
3.2.2 Measure Menu....65
3.2.2.1 Instantaneous Menu....66
3.2.2.2 Energy Menu....66
3.2.2.2.1 Imp. Active Menu (Imported Active Energy Menu)....67
3.2.2.2.2 Exp. Active Menu (Exported Active Energy Menu)....69
3.2.2.2.3 Ind. Reactive Menu (Inductive Reactive Energy Menu)....69
3.2.2.2.4 Cap. Reactive Menu (Capacitive Reactive Energy Menu)....69
3.2.2.3 Demand Menu....69
3.2.2.3.1 Current Menu....70
3.2.2.3.1.1 Act. Power Menu....71
3.2.2.3.1.2 Rea. Power Menu....71
3.2.2.3.1.3 App. Power Menu....71
3.2.2.4 Phasor diagram Menu....71
3.2.2.5 Harmonics Menu....72
3.2.2.5.1 Table Menu....72
3.2.2.5.2 Graphic Menu....73
3.2.3 Comp. (Compensation) Menu....73
3.2.3.1 Switch Count Menu....74
3.2.3.2 Conn. Time Menu....74
3.2.3.3 DCM (Dynamic Capacitor Monitoring)....74
3.2.3.4 Learn Conn. Menu....75
3.2.3.5 Learned Conn. Menu....75
3.2.3.6 Learn Steps Menu....76
3.2.4 Alarms Menu....76
3.2.4.1 Phase1 Menu....77
3.2.4.2 Phase2 Menu....78

3.2.4.3 Phase3 Menu....78
3.2.4.4 Step Menu....78
3.2.4.5 Other Menu....78
3.2.5 Analysis Menu....79
3.2.5.1 Minimum Menu....80
3.2.5.1.1 Hourly Menu....80
3.2.5.1.1.1 Phase1 Menu....80
3.2.5.1.1.2 Phase2 Menu....80
3.2.5.1.1.3 Phase3 Menu....80
3.2.5.1.1.4 Other....81
3.2.5.1.2 Daily Menu....81
3.2.5.1.3 Monthly Menu....81
3.2.5.2 Maximum Menu....81
3.2.5.3 Average Menu....81
3.2.5.4 Energy Menu....81
3.2.5.4.1 Hourly Menu....82
3.2.5.4.2 Daily Menu....82
3.2.5.4.3 Monthly Menu....82

SECTION 4 FACTORY PRESETS....84

SECTION 5 TECHNICAL SPECIFICATIONS....90

FIGURES

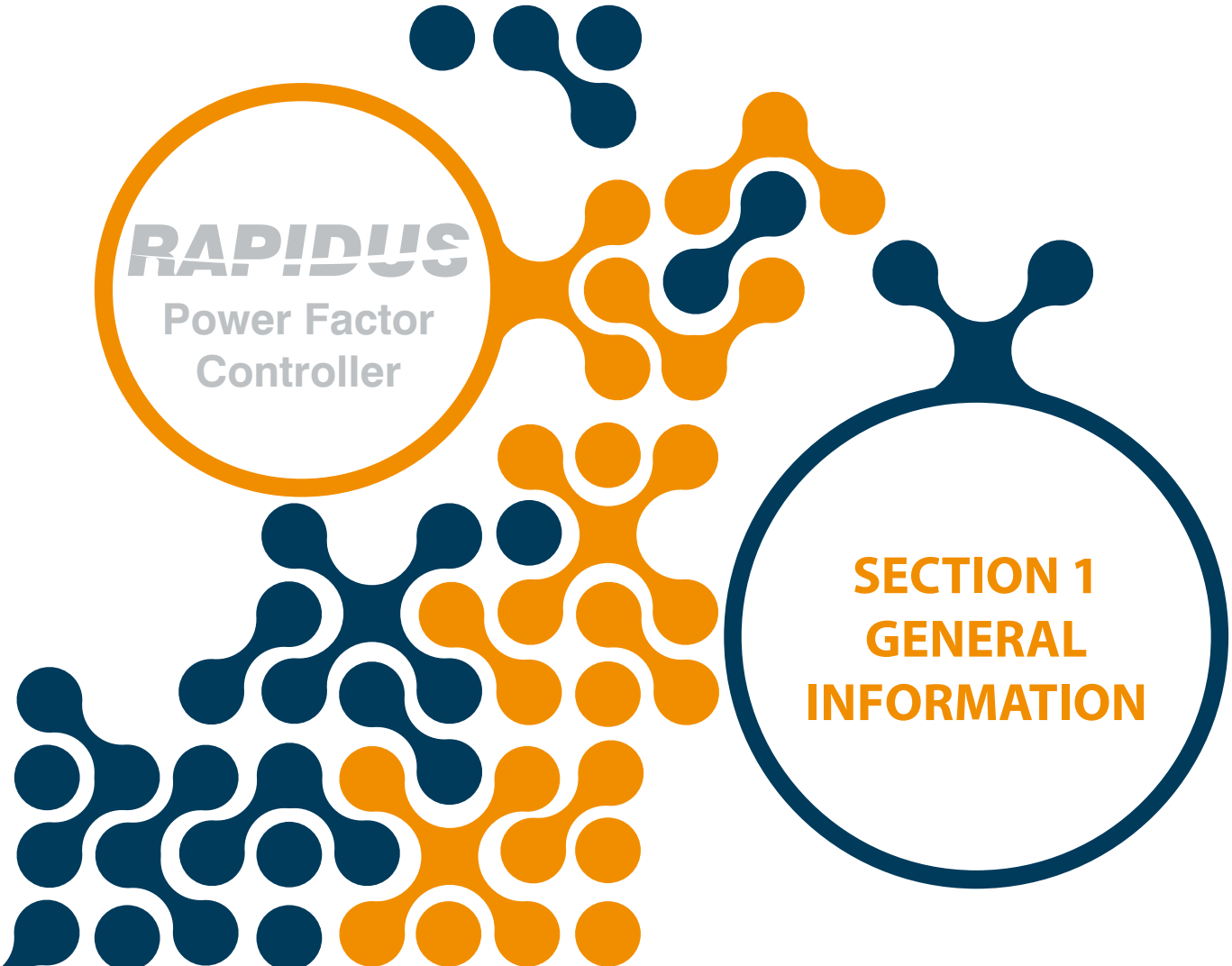
Fig. 1-1 RAPIDUS Display 13

Fig. 2-1 Placing RAPIDUS on the Panel 15
Fig. 2-2 Securing RAPIDUS 16
Fig. 2-3 Loosening of the Terminal Screws 16
Fig. 2-4 Inserting Cable into the Terminal Block 17
Fig. 2-5 Fixing the Cable to the Terminal Block 17
Fig. 2-6 RAPIDUS Connection Diagram 18
Fig. 2-7 Dimensions 18

Fig. 3-1 First Operation Settings 20
Fig. 3-2 Dil / Lang./ Язык Setting 20
Fig. 3-3 Date Setting 21
Fig. 3-4 Date Setting Example 21
Fig. 3-5 Current Transformer Ratio 22
Fig. 3-6 Entering a Value in Virtual Keyboard 23
Fig. 3-7 Voltage Transformer Ratio 24
Fig. 3-8 Step Structure 24
Fig. 3-9 Restart 25
Fig. 3-10 Startup Screen when the Connections Are Being Learned 25
Fig. 3-11 Startup Screen after the Connections Are Learned 26
Fig. 3-12 Settings Menu 26
Fig. 3-13 Quick Setup Menu 27
Fig. 3-14 RAPIDUS Prompt for saving 28
Fig. 3-15 Network Menu 29
Fig. 3-16 Current Transformer Ratio Setting 29
Fig. 3-17 Voltage Transformer Ratio Setting 30
Fig. 3-18 Demand Period Setting 30
Fig. 3-19 Step Menu 31
Fig. 3-20 Ent. Power Menu 31
Fig. 3-21 Ent. Type Menu 32
Fig. 3-22 Predefined Menu 32
Fig. 3-23 Other Menu 34
Fig. 3-24 Compensation Menu 34
Fig. 3-25 Compensation Menu 35
Fig. 3-26 RAPIDUS Mode Compensation Steps 36
Fig. 3-27 RAPIDUS Asc. Sequential Mode 37
Fig. 3-28 RAPIDUS Des. Sequential Mode 39
Fig. 3-29 RAPIDUS Linear Mode 41
Fig. 3-30 RAPIDUS Circular Mode 43
Fig. 3-31 Manual Mode Menu 44
Fig. 3-32 Averaging Time Menu 46
Fig. 3-33 Fixed Steps Menu 46
Fig. 3-34 Connection Setup 47

Fig. 3-35 Learning Connections at the Startup 48
Fig. 3-36 Waiting Time After Unsuccessful Connection Learning 48
Fig. 3-37 Retry Timer 49
Fig. 3-38 Retry Number 49
Fig. 3-39 Aux. Input 49
Fig. 3-40 Device Menu 50
Fig. 3-41 Contrast Setting 51
Fig. 3-42 Pass. Protection 51
Fig. 3-43 New Password Entry 52
Fig. 3-44 Display On Time Setting 52
Fig. 3-45 Energy Menu 53
Fig. 3-46 Baud Rate Setting 54
Fig. 3-47 Slave Id Setting 54
Fig. 3-48 Alarm Menu 55
Fig. 3-49 Energy Menu 55
Fig. 3-50 V(L-N) Alarm Menu 56
Fig. 3-51 Alarm Relay Setting 56
Fig. 3-52 Alarm Time Setting 57
Fig. 3-53 Hysteresis Setting 57
Fig. 3-54 Alarm Example 57
Fig. 3-55 V Harmonics Alarm Menu 59
Fig. 3-56 THDV High Limit Setting 59
Fig. 3-57 V3-V21 Harmonics High Limit Setting 60
Fig. 3-58 No Alarm Time Condition 60
Fig. 3-59 Invalid Limit 61
Fig. 3-60 Clear Menu 61
Fig. 3-61 Before Clearing 62
Fig. 3-62 After Clearing 62
Fig. 3-63 Initial Value Entered After Clearing 62
Fig. 3-64 Date/Time Menu 63
Fig. 3-65 System Info 63
Fig. 3-66 Password 64
Fig. 3-67 RAPIDUS Restart 64
Fig. 3-68 Default Settings 65
Fig. 3-69 Measure Menu 65
Fig. 3-70 Instantaneous Menu 66
Fig. 3-71 Imp. Active Energy Page 67
Fig. 3-72 Hour Start Example 67
Fig. 3-73 Day Start Example 68
Fig. 3-74 Month Start Example 68
Fig. 3-75 Demand Menu 69
Fig. 3-76 Demand Example 70
Fig. 3-77 Current Menu 70
Fig. 3-78 Phasor Diagram Menu 72
Fig. 3-79 Harmonics Table Menu 72
Fig. 3-80 Graphic Menu 73

Fig. 3-81 Comp. Menu 73
Fig. 3-82 Switch Count 74
Fig. 3-83 Conn. Time 74
Fig. 3-84 Learn Conn. 75
Fig. 3-85 Learned Conn. 75
Fig. 3-86 Learn Steps 76
Fig. 3-87 Alarms Menu 77
Fig. 3-88 Phase1 Menu 77
Fig. 3-89 Step Menu 78
Fig. 3-90 Other Menu 78
Fig. 3-91 Analysis Menu 79
Fig. 3-92 Minimum Menu 80
Fig. 3-93 Hourly Menu 80
Fig. 3-94 Energy Menu 81


RAPIDUS
Power Factor
Controller
SECTION 1
GENERAL
INFORMATION

SECTION 1 GENERAL INFORMATION

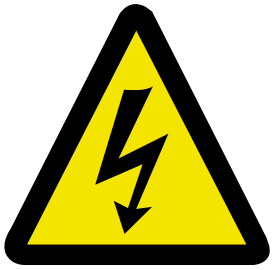
1.1 Symbols

Caution:

This symbol indicates that there is cautionary information where it is used.

Danger of Electric Shock:

This symbol indicates that there is dangerous voltage or current.



1.2 General Warnings

- Ensure that energy supply is cut off in the panel or in all relevant systems before attempting to connect the device to mains.
- Installation and connections shall be performed by qualified persons with respect to the instructions on the user's manual.
- Device shall only be activated after all connections are made.
- We advise you to connect a 2 A fuse between the voltage inputs of the device and the mains and supply input and mains.
- We advise you to connect a 1 mm2 (AWG17) cable to supply input and measure inputs; and to connect a 2 mm2 (AWG14Cu) cable to the current inputs.
- Do not remove RAPIDUS current transformer connections without short circuiting the K-L ends of the current transformer to somewhere else or connecting a load adequately low impedance to the K-L ends. Otherwise, dangerous high voltages may occur on the secondary ends of the current transformer. The same applies to starting of the device.
- Device shall be placed away from damped, wet, vibrating and dusty environments.
- Use a dry cloth to clean the device or remove the dust on it. Do not use alcohol, thinner or an abrasive agent.
- Do not open the inside of the device. There are no user-maintainable components inside.

1.3 Receipt Control and Contents of the Delivery

When the RAPIDUS is delivered to you, check that:

- the packing of RAPIDUS is in good condition
- the product is not damaged during transport
- name of the product and order number is correct.

RAPIDUS Order No:	Description:
606 000	RAPIDUS 3 PHASE WITH 12 RELAYS
606 005	RAPIDUS 3 PHASE WITH 12 RELAYS (DCM)

Contents of the RAPIDUS packing is listed below.

- 1 RAPIDUS
- 1 CD-ROM (User's Manual)
- 4 panel tightening tools
- 1 pc of 4-pin female terminal for alarm outputs (NO, C/out2, C/out1, NO)
- 1 pc of 6-pin female terminal for current inputs (I1, k1, I2, k2, I3, k3)
- 1 pc of 4-pin female terminal for voltage input (V1, V2, V3, N)
- 2 pcs of 7-pin female terminal for step outputs (Com1, Com2, K1…K12)
- 1 pc of RS485 3-pin female terminal (B, GND, A)
- 1 pc of 2-pin female terminal for generator input (GenA, GenB)

1.4 RAPIDUS Reactive Power Control Relay

RAPIDUS is a multi-function reactive power control relay. It measures active, reactive and total powers of the system that it is connected. As a result of these measurements, it activates capacitor and shunt reactors in the compensation panel. Thus, it compensates the system reactive power bidirectionally.

RAPIDUS counters record "imported active", "exported active", "inductive reactive" and "capacitive reactive" energy values.

All user actions can be performed easily using the 160x240 graphic LCD display and 6 keys on the front panel.

RAPIDUS has an isolated RS485 port.

It also has 2 alarm relay outputs.

RAPIDUS measures/calculates

- Current, voltage and frequency
- Active, reactive and apparent power
- Current and voltage harmonics up to 51st harmonics
- THDV, THDI
- Power factor, cosØ

values for each phase.

RAPIDUS has features such as:

- Learning connection methods
- Learning step powers and types
- Recording switching numbers and duty ratios for each step
- Compensation possibility with 6 different programs
- Determination of whether the activated step is faulty and dynamic step monitoring
- For active, reactive (inductive and capacitive) energy, values of index, hourly, previous hour, previous day, monthly and previous month
- Compensation in 12 steps
- Current and voltage harmonics measurement up to 51st harmonics
- Testing possibility for relays and steps
- Automatic calculation of C/k ratio

Also, RAPIDUS has the following features:

- Setting an alarm for various measurement paramateres
- Provision of counter monitoring by assigning initial counter values
- Prevention of unauthorized usage with 4 digit password input
- Battery supported real time timer and memories

1.5 RAPIDUS Front Panel

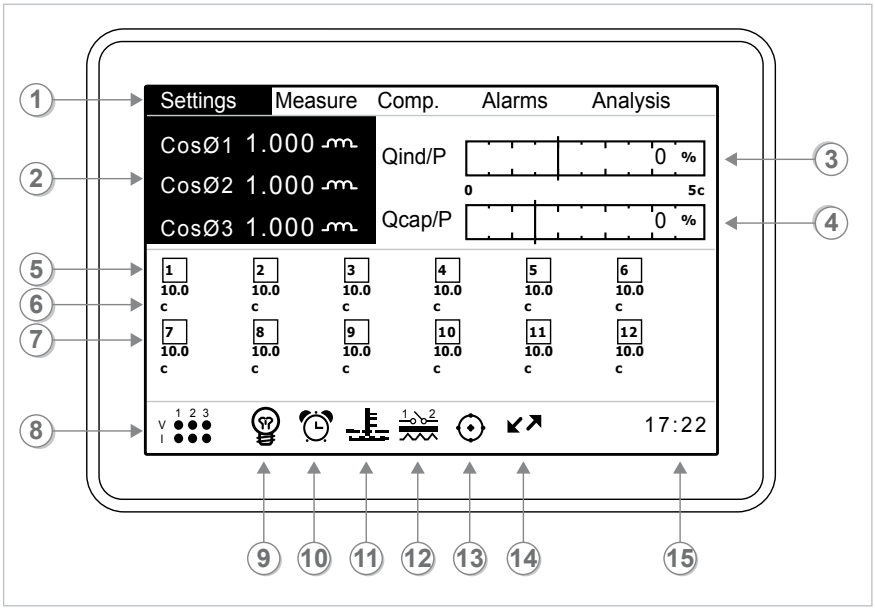


Fig. 1-1 RAPIDUS Display

1 Menus

2 Cos Ø values for 3 phases

3 Monthly average inductive ratio

4 Monthly average capacitive ratio

5 Number of steps

6 Step power

7 Step type

8 Presence/absence of currents and voltages for voltages; order of phases

9 Selected compensation mode

10 Alarm status symbol (displayed when an alarm occurred in the system)

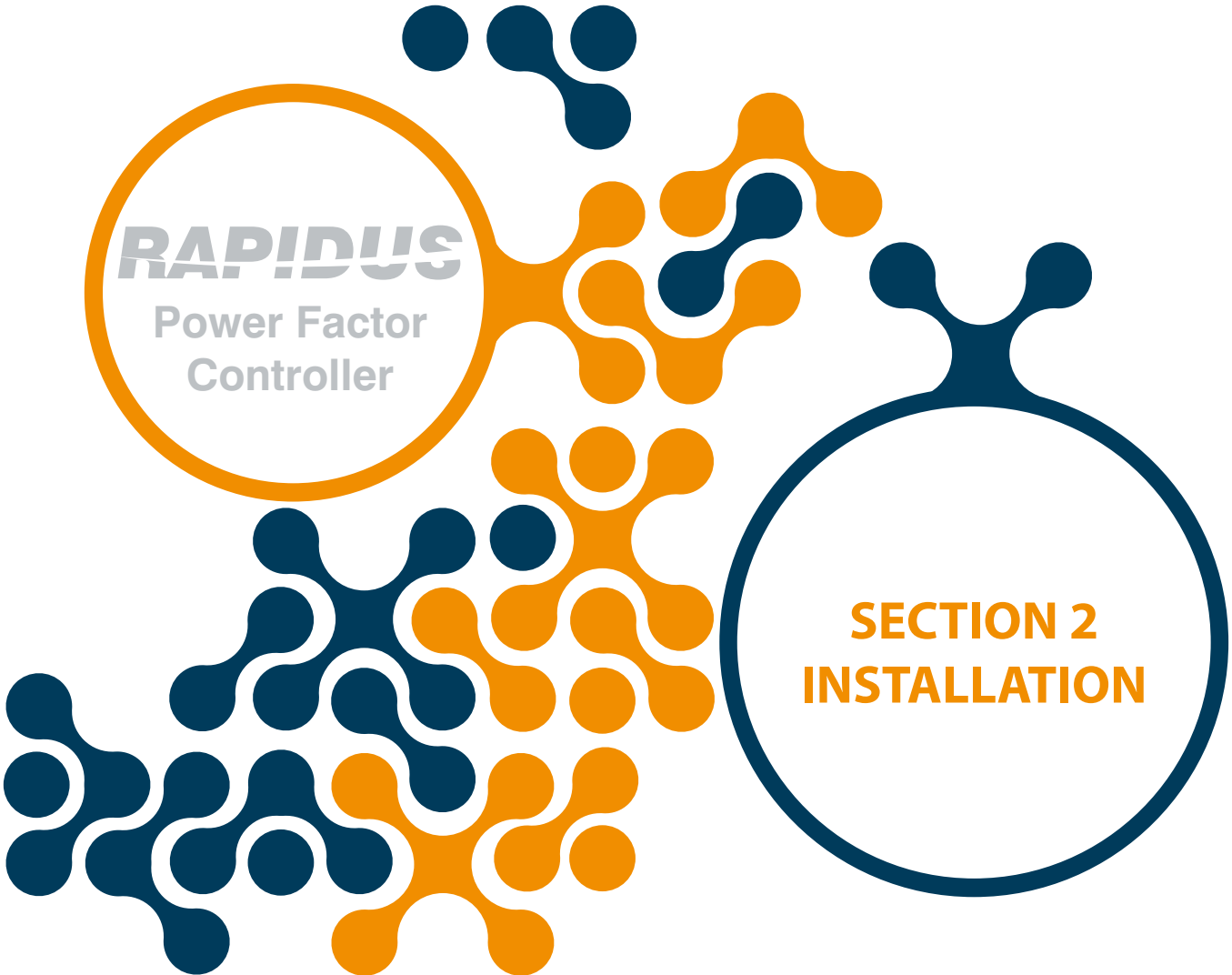
11 Temperature alarm status symbol (displayed when an alarm occurred in the system)

12 Alarm relay symbol (This symbol is displayed if 1st and/or 2nd alarm relay is assigned to an alarm and an alarm is present in the system. "1" indicates 1st alarm relay, and "2" indicates 2nd alarm relay on the symbol)

13 Indicates that DCM is active

14 RS485 communication symbol

15 Cooling clock


RAPIDUS
Power Factor
Controller
SECTION 2
INSTALLATION

SECTION 2 INSTALLATION

This section contains information on the installation, cable connections and connection methods of RAPIDUS.

2.1 Preparation for Installation

RAPIDUS that you have purchased may not include all hardware options specified in the installation manual. This is not issue for the electrical installation.

Installation and connections of RAPIDUS shall be performed by qualified persons with respect to the instructions on the user's manual.

Do not operate the device before making the connections correctly.

2.2 Placing on the panel

RAPIDUS is placed vertically on the empty compartment on the panel.

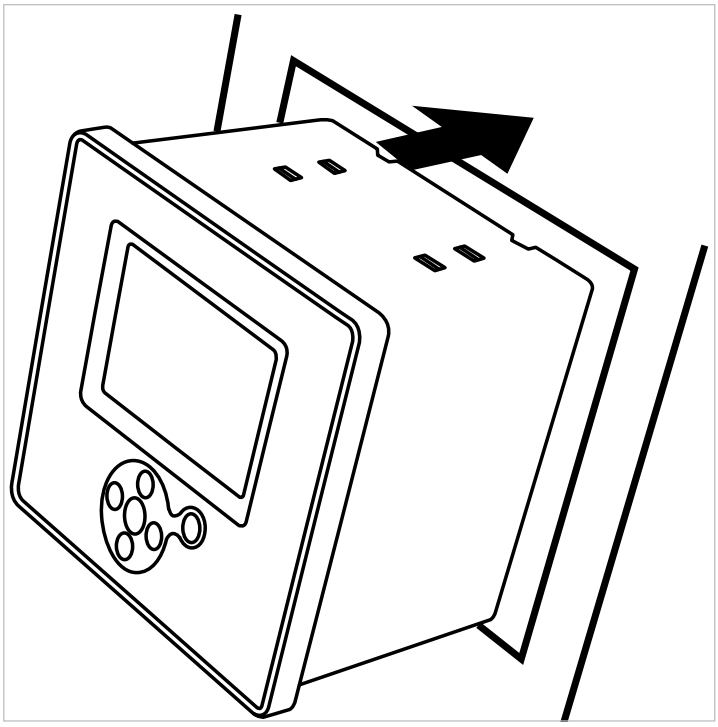


Fig. 2-1 Placing RAPIDUS on the Panel

After placing RAPIDUS on the panel tightening tool is installed and then secured by tightening its screw.

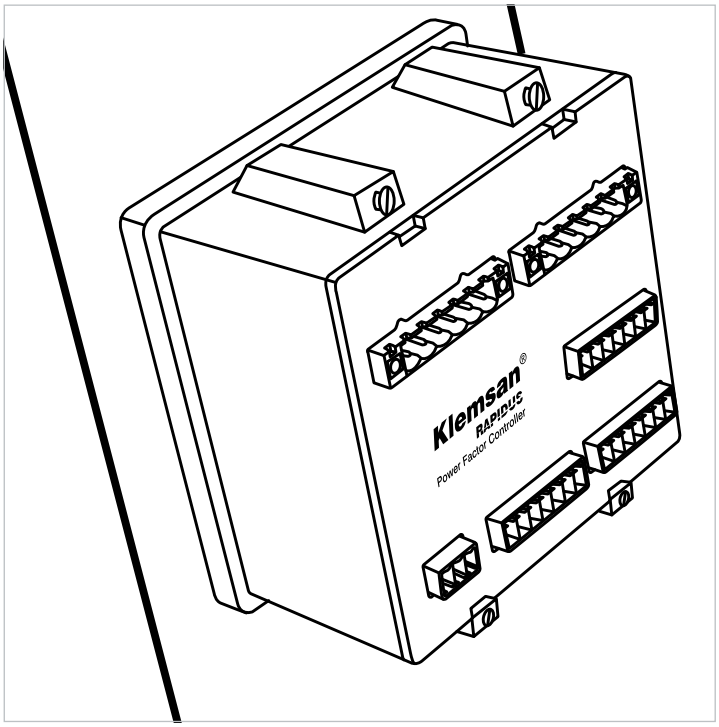


Fig. 2-2 Securing RAPIDUS

RAPIDUS has female terminals with 2.5mm^2 and 1.5mm^2 screws. Female terminal is removed on its housing on RAPIDUS (removed from the fixed male terminal). Screws on the female terminal are loosened.

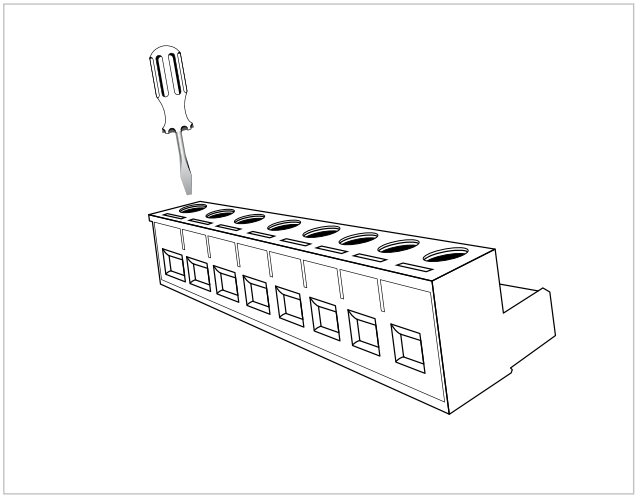


Fig. 2-3 Loosening of the Terminal Screws

Make sure that the power is cut off before connecting voltage and current ends to RAPIDUS.

Do not remove RAPIDUS current transformer connections without short circuiting the K-L ends of the current transformer to somewhere else. Otherwise, dangerous high voltages may occur on the secondary ends of the current transformer. The same applies to starting of the device.

Cable is placed in the relevant connection hole.

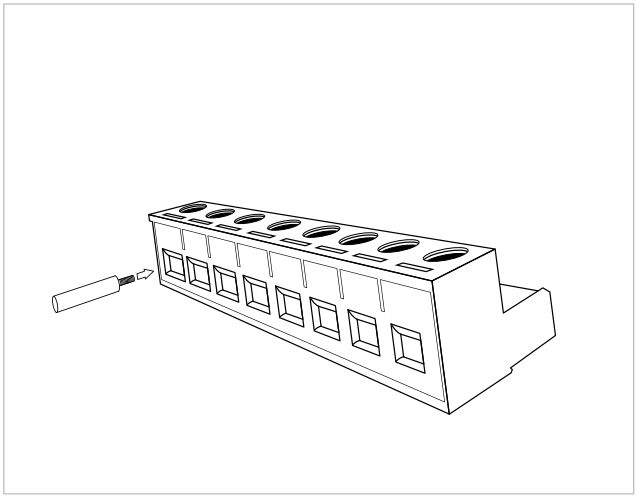


Fig. 2-4 Inserting Cable into the Terminal Block

After the cable is placed, the screws are tightened and the cable is fixed.

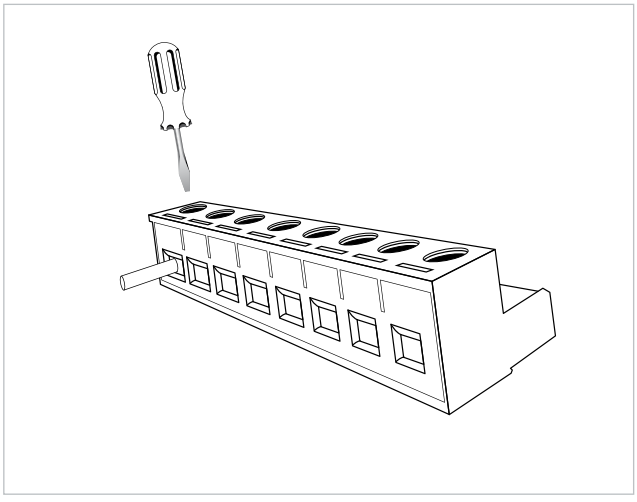


Fig. 2-5 Fixing the Cable to the Terminal Block

Terminal is placed on its housing on RAPIDUS.

Consider this warning if RAPIDUS is used with current transformers.
Correct operating threshold values of transformers vary as per the type and size of the current transformers used. Before applying the information given in the following warning, check that the measured current value is higher than the current threshold specified in the user's manual of current transformer.

2.3 Wiring Diagrams

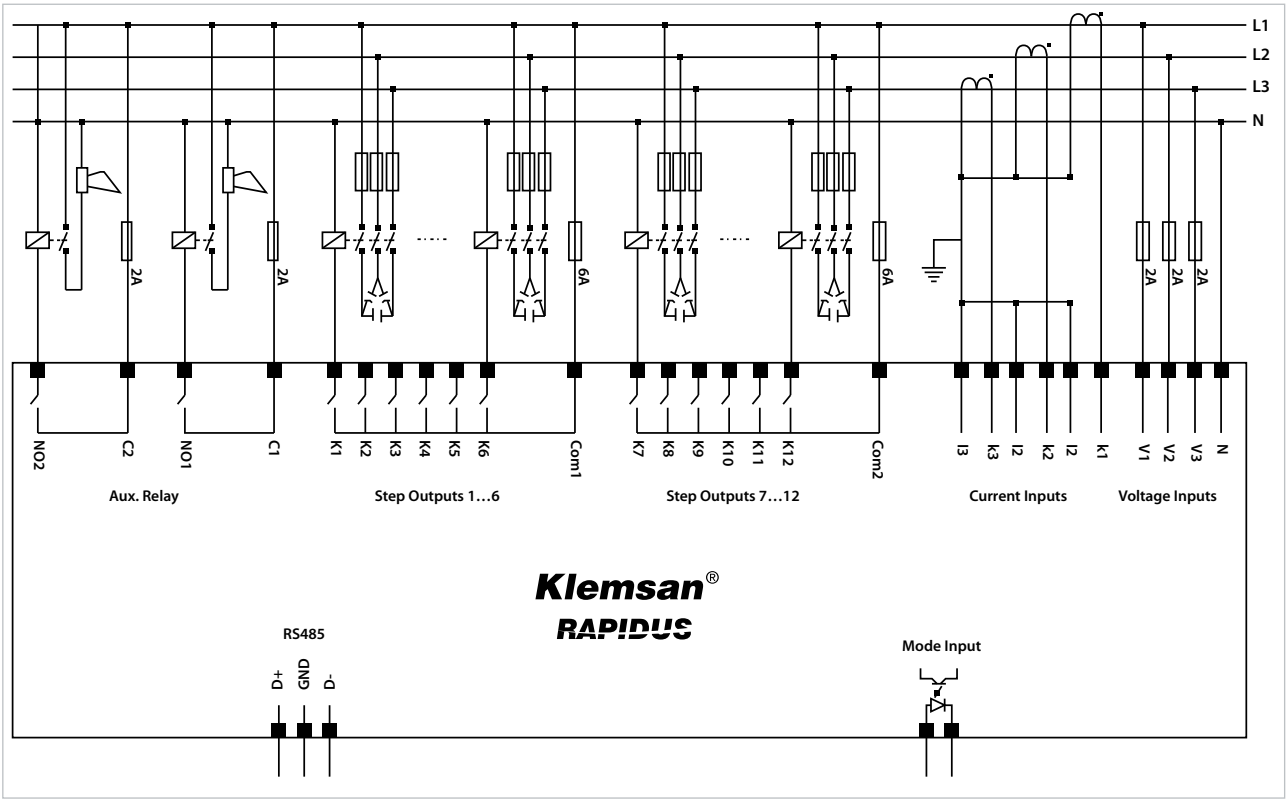


Fig. 2-6 RAPIDUS Connection Diagram

2.4 Dimensions

Dimensions are in millimeters.

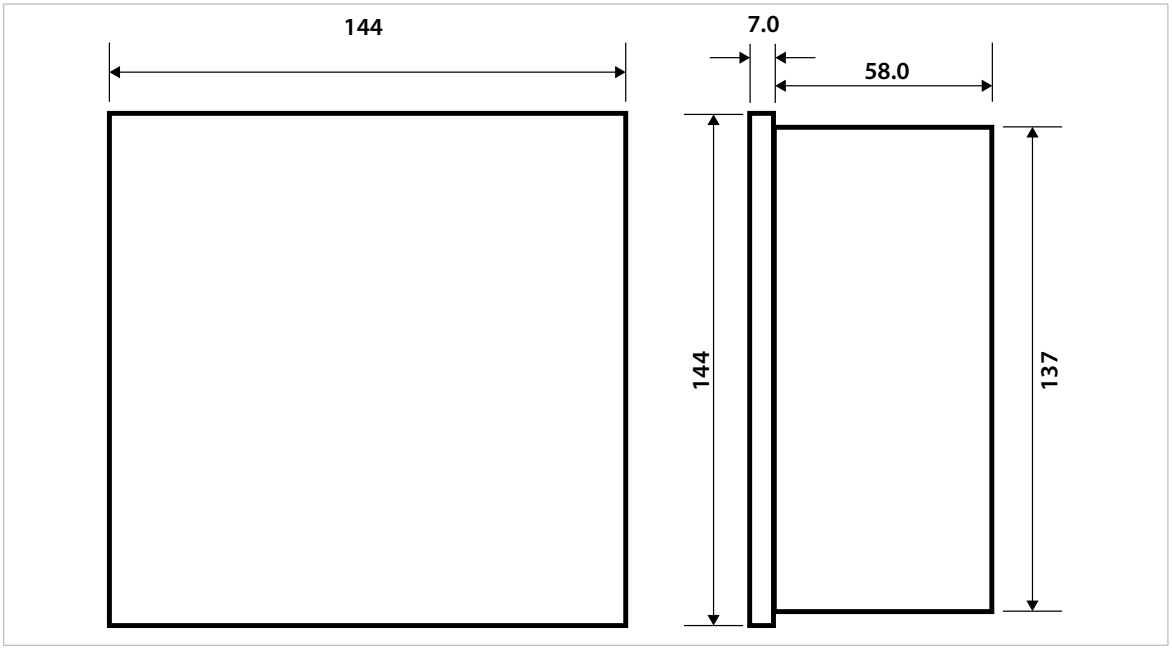
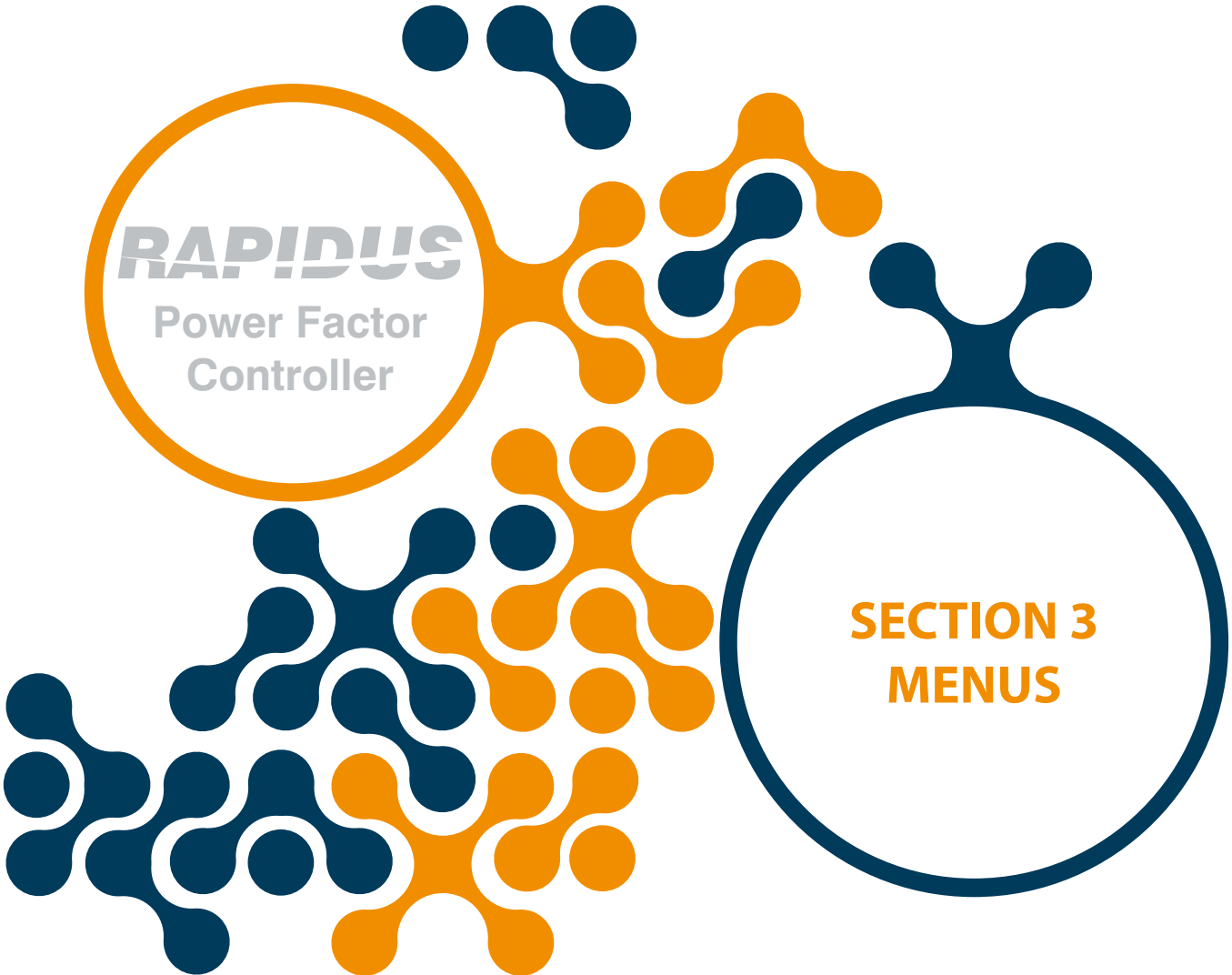


Fig. 2-7 Dimensions


RAPIDUS
Power Factor
Controller
SECTION 3
MENUS

SECTION 3 MENUS

3.1 "First Power-on" Settings

The following page is displayed when RAPIDUS is energized for the "first time" after it is released from the factory

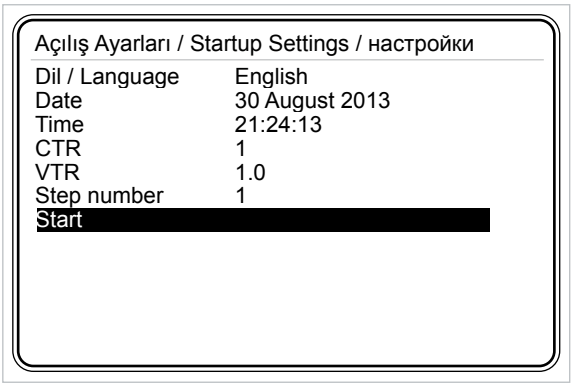


Fig. 3-1 First Operation Settings

3.1.1 Dil / Lang. / Язык Setting

"Türkçe" and "English" and "Русский" language options are displayed when you press OK while this tab is selected. User shall select the desired option with up and down arrows and press "OK". If the language is selected as Turkish, the language settings for all other tabs shall also be Turkish.

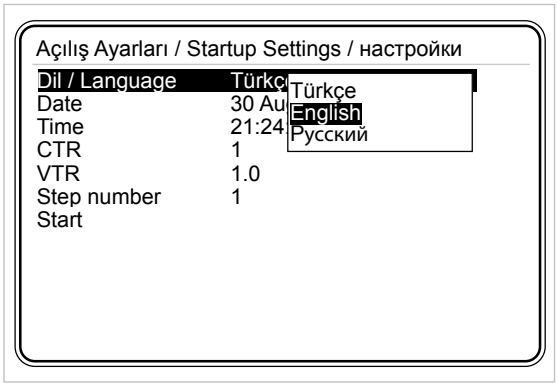


Fig. 3-2 Dil / Lang./ Язык Setting

3.1.2 Date

Date setting of RAPIDUS is performed here. Press OK when this option selected. Highlight day, month or year digits with the right and left arrow keys. Date setting is performed with up and down keys. Date setting is completed by pressing OK.

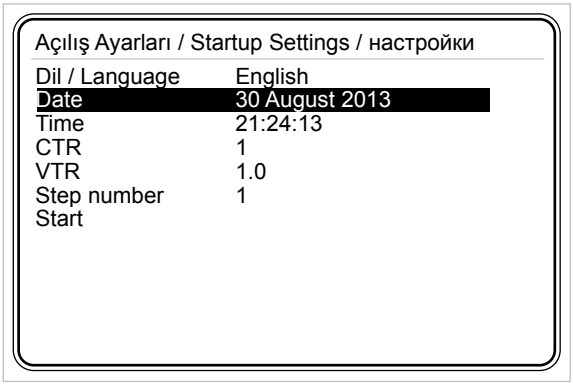


Fig. 3-3 Date Setting

Example: To select "August 30th, 2013":

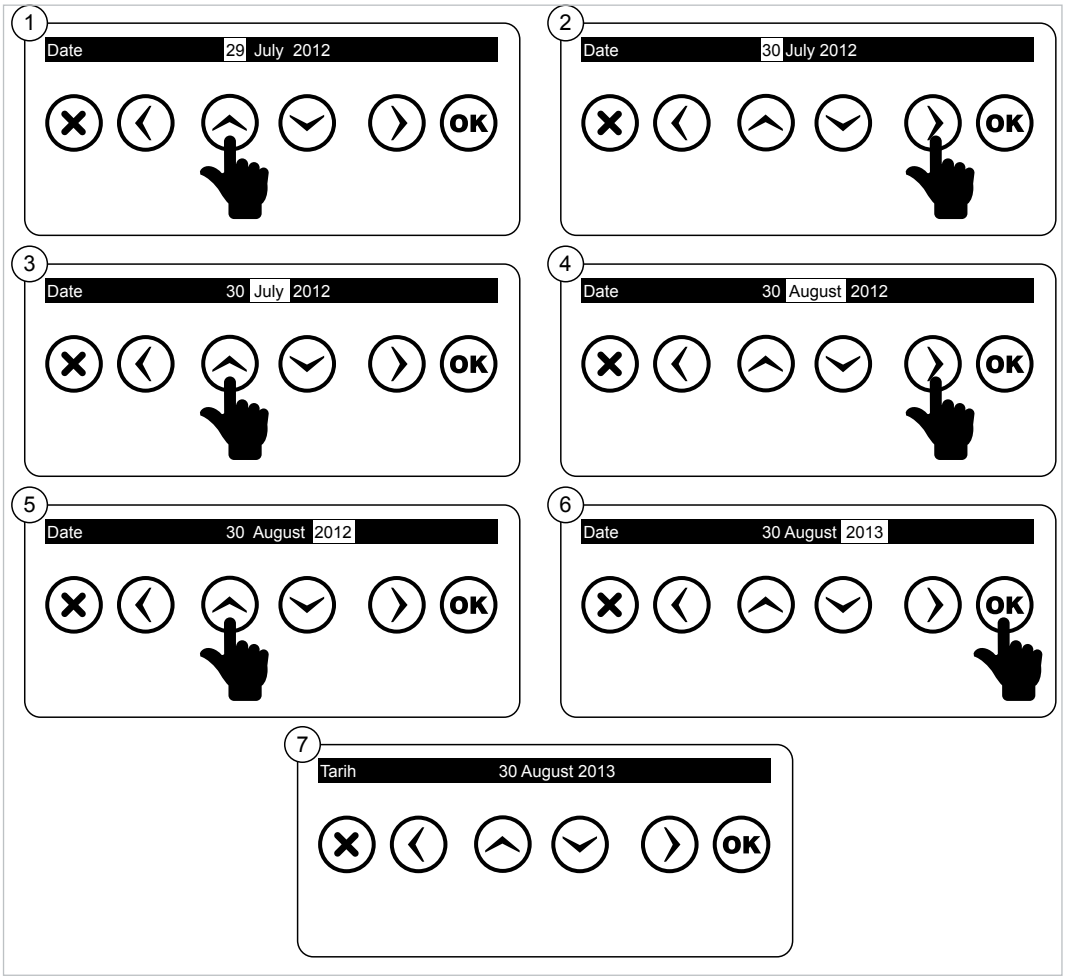


Fig. 3-4 Date Setting Example

3.1.3 Time

Time setting of RAPIDUS is performed here. It is set as described on3.1.2 Date menu.

3.1.4 Current Transformer Ratio (CTR)

This is the settings tab for entering the current transformer ratio. Current transformer ratio may be selected between 1 and 5000. RAPIDUS Virtual Keyboard shall be displayed when you press OK when this option selected.

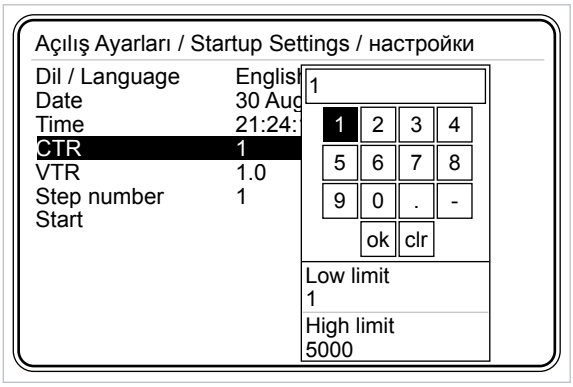


Fig. 3-5 Current Transformer Ratio

Use arrow keys to navigate between the digits and OK key to enter the selected digit as a value. If you enter an incorrect number, select clr box and press OK. Thus, the incorrect number entered shall be deleted.

Current transformer ratio shall be entered correctly to ensure that RAPIDUS performs a correct compensation.

Example:

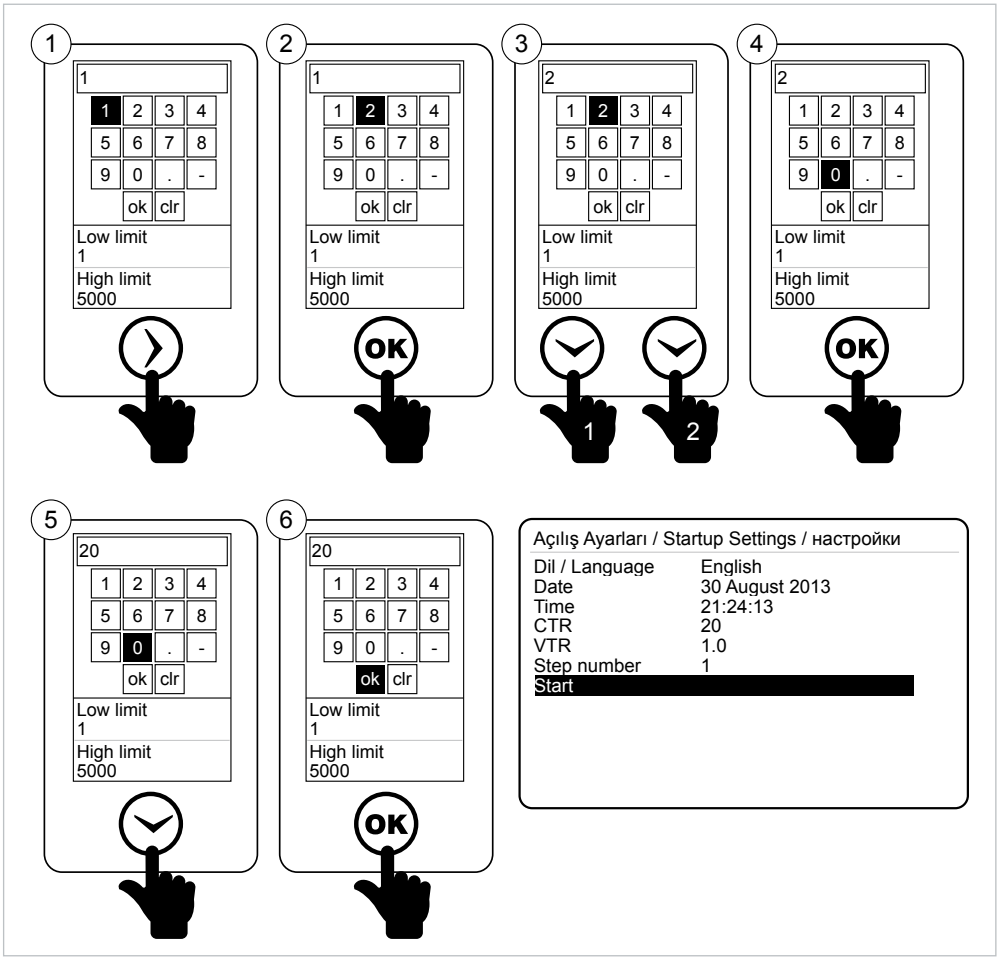


Fig. 3-6 Entering a Value in Virtual Keyboard

3.1.5 Voltage Transformer Ratio (VTR)

This is the settings tab for entering the voltage transformer ratio. Voltage transformer ratio may be selected between 1 and 5000. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.). If you will enter a number with a decimal place for voltage transformer ratio, select the [.] box on the Virtual Keyboard with arrow keys and press OK.

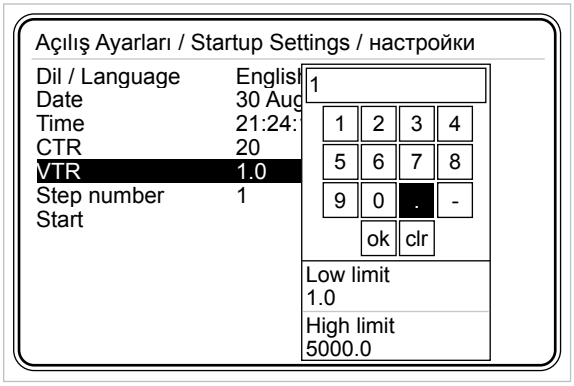


Fig. 3-7 Voltage Transformer Ratio

Voltage transformer ratio shall be entered correctly to ensure that RAPIDUS performs a correct compensation.

3.1.6 Step number

You shall enter the 3-phase capacitor step number required for learning the connections from this menu

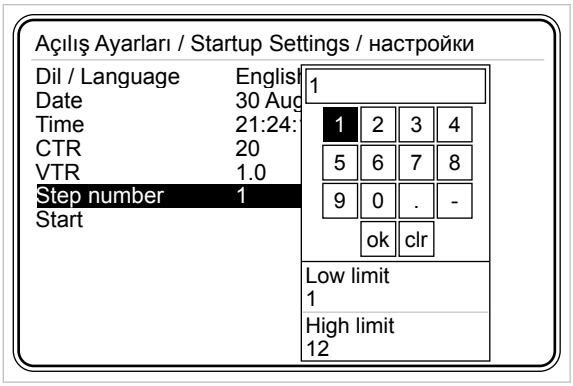


Fig. 3-8 Step Structure

3.1.7 Restart

RAPIDUS shall be restarted when you press OK when the Restart tab is highlighted.

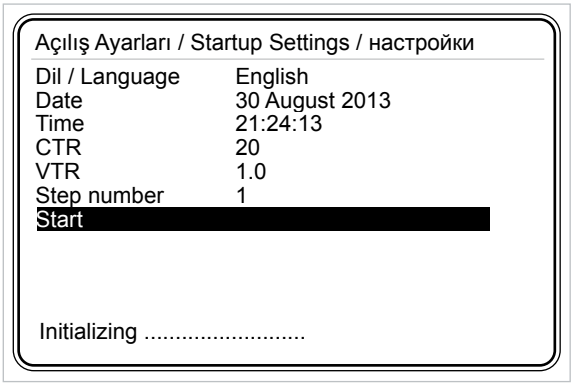


Fig. 3-9 Restart

RAPIDUS startup settings page is displayed when the RAPIDUS is powered up for the first time. After RAPIDUS is restarted, all settings (including startup settings) may be changed from the Settings menu.

3.2 Startup Screen

Following screen page shall be displayed after RAPIDUS is started. Device shall learn the connections first, and then the step powers respectively when it is started.

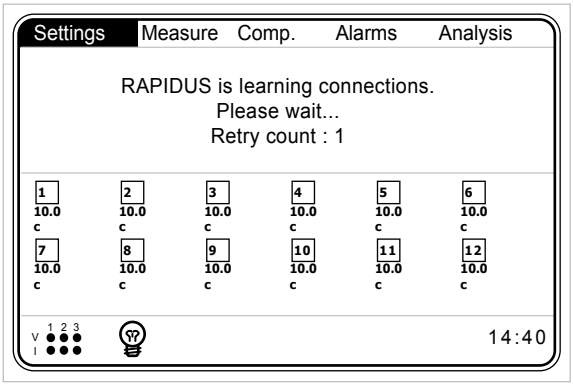


Fig. 3-10 Startup Screen when the Connections Are Being Learned

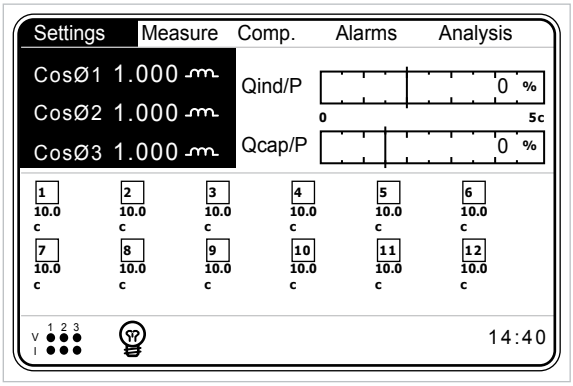


Fig. 3-11 Startup Screen after the Connections Are Learned

Multi selection menus are displayed on the upper part of the screen.

Upper left corner is used for displaying cosØ values of each phase.

Upper right corner displays capacitive and inductive ratios.

Status of the phases and compensation mode are displayed on the lower left corner, and system clock is displayed on the lower right corner.

User may navigate on the menus on the upper side of the screen using left and right arrow keys, and access the contents of the menus by pressing OK.

3.2.1 Settings

RAPIDUS settings are made from this menu. If you press OK when the settings tab is highlighted, sub-menus shall be displayed as shown in Fig. 3-12. Sub-menus below are available under the settings tab.

- Quick setup
- Setup
- Date/Time
- System info
- Password
- Restart
- Default Settings

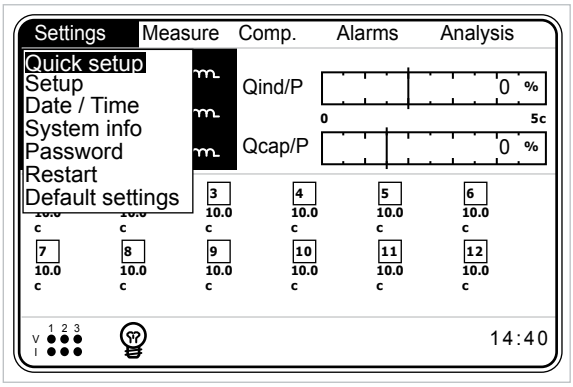


Fig. 3-12 Settings Menu

3.2.1.1 Quick setup Menu

Sub-menus below are available under the quick setup tab:

- Dil / Lang. / Язык
- Date
- Time
- CTR
- VTR
- Step number

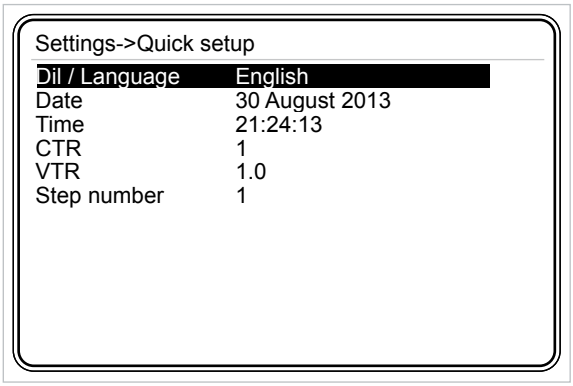


Fig. 3-13 Quick Setup Menu

3.2.1.1.1 Language Setting

Language is selected in this tab (See 3.1.1).

3.2.1.1.2 Date Menu

Date setting is performed here (See 3.1.2).

3.2.1.1.3 Time Menu

Time setting is performed here (See 3.1.3).

3.2.1.1.4 CTR

Current transformer ratio is entered here (See 3.1.4).

3.2.1.1.5 VTR

Voltage transformer ratio is entered here (See 3.1.5).

3.2.1.1.6 Step number

RAPIDUS activates a 3-phase capacitor when it learns the connections. You shall enter the 3-phase capacitor number to be used for learning the connections in this menu.

In order to store the new settings in the nonvolatile memory, you shall return back to the "Startup Screen" from the tab where the changes are made using X key. Press OK when "Settings changed. Save?" message is displayed on the Screen. Thus, the changes are saved and stored in the nonvolatile memory. The changes shall not be saved and stored in the nonvolatile memory if X key is pressed.

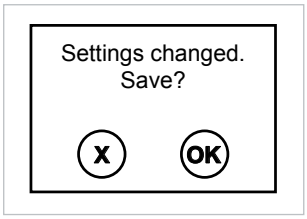


Fig. 3-14 RAPIDUS Prompt for saving

Changes shall be saved on the nonvolatile memory if you press OK when "Settings changed. Save?" message is displayed on the Screen. The changes shall not be saved and stored in the nonvolatile memory if X key is pressed.

3.2.1.2 Setup Menu

Sub-menus below are available under the setup tab:

- Network
- Step
- Compensation
- Learning
- Aux. input
- Device
- Energy
- Communication
- Alarm
- Clear

User may navigate inside the menu using up and down arrow keys, and access the contents of the menus (sub-menus under the setup menu) by pressing OK.

3.2.1.2.1 Network Menu

This menu is used for performing the network settings.

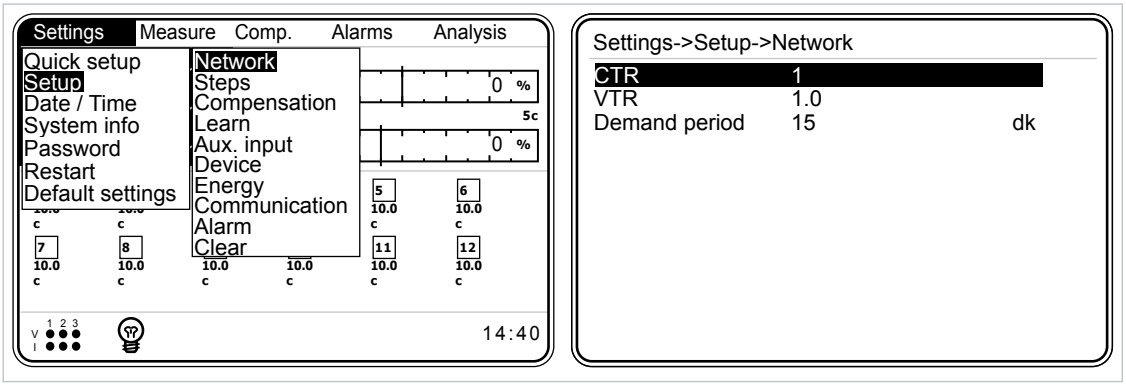


Fig. 3-15 Network Menu

3.2.1.2.1.1 CTR Setting

This is the settings tab for entering the current transformer ratio. Current transformer ratio may be selected between 1 and 5000. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

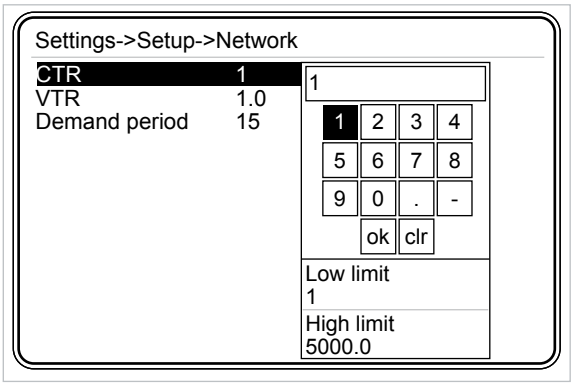


Fig. 3-16 Current Transformer Ratio Setting

Current transformer ratio shall be entered correctly to ensure that RAPIDUS performs a correct measurement.

3.2.1.2.1.2 VTR Setting

This is the settings tab for entering the voltage transformer ratio. Voltage transformer ratio may be selected between 1.0 and 5000.0. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.). If you will enter a number with a decimal place for voltage transformer ratio, select the [.] box on the Virtual Keyboard with arrow keys and press OK.

> Voltage transformer ratio shall be entered correctly to ensure that RAPIDUS performs a correct measurement.

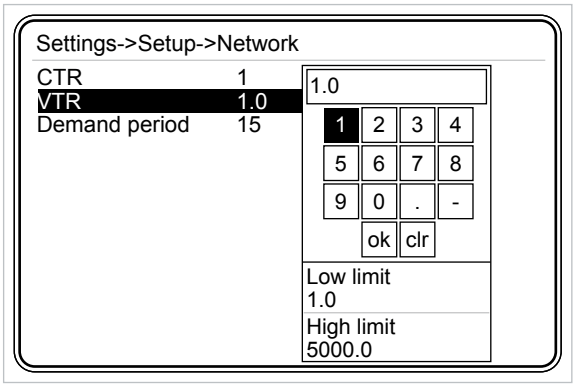


Fig. 3-17 Voltage Transformer Ratio Setting

3.2.1.2.1.3 Demand period setting

This is the settings tab for entering the demand period. Demand period may be selected between 1 and 60 minutes. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

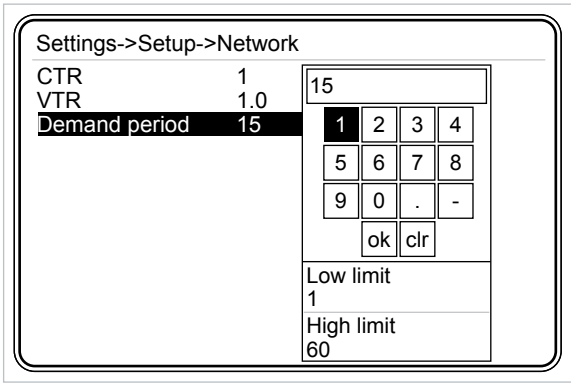


Fig. 3-18 Demand Period Setting

3.2.1.2.2 Step Menu

This menu includes the sub-menus below:

- Ent. power
- Ent. type
- Predefined
- Other

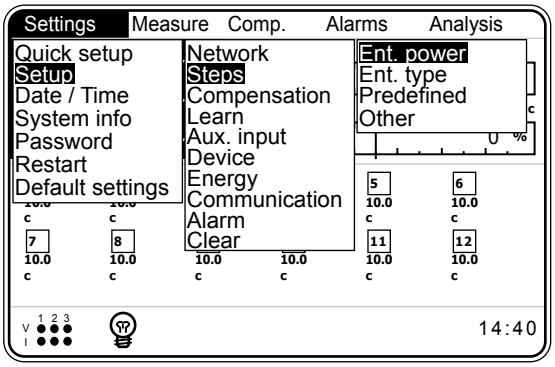


Fig. 3-19 Step Menu

3.2.1.2.2.1 Ent. Power Menu

Step powers learned by RAPIDUS are indicated in this menu. Also, user may enter/change all step powers manually using this menu.

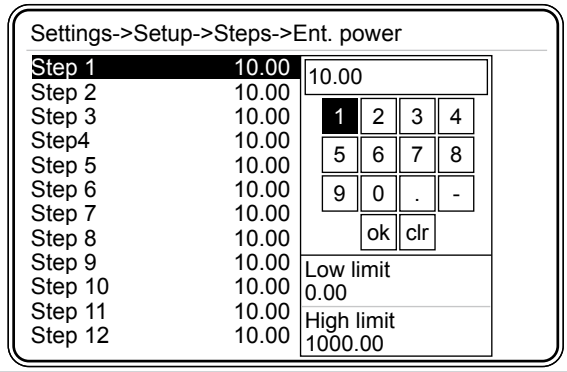


Fig. 3-20 Ent. Power Menu

3.2.1.2.2.2 Ent. Type Menu

Step types learned by RAPIDUS are indicated or user may set the step powers in this menu.

"C" is for 3-phase capacitor,
"C1" is for single-phase capacitor connected to R phase,
"C2" is for single-phase capacitor connected to S phase,

"C3" is for	single-phase capacitor connected to TR phase,
"L" is for	3-phase shunt reactor,
"L1" is for	single-phase shunt reactor connected to R phase,
"L2" is for	single-phase shunt reactor connected to S phase,
"L3" is for	single-phase shunt reactor connected to T phase,
"C1-2" is for	two-phase capacitor connected to R and S phases,
"C2-3" is for	two-phase capacitor connected to S and T phases,
"C3-1" is for	two-phase capacitor connected to R and T phases,

You shall check whether RAPIDUS has learned step types correctly from this menu. If RAPIDUS has not learned step types correctly, perform one of the following.
- RAPIDUS is commanded to learn the steps again (See 3.2.3.6 Learn Steps Menu)
- Step types are corrected manually. (See Fig. 3-21)

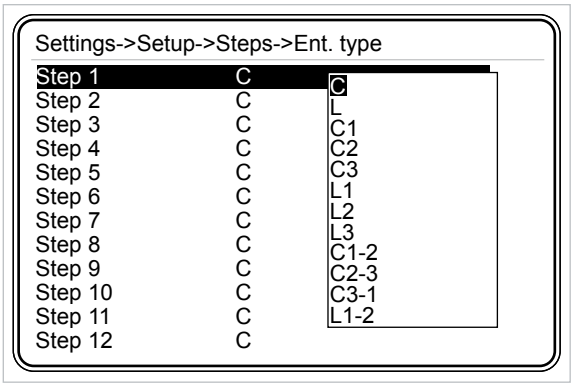


Fig. 3-21 Ent. Type Menu

3.2.1.2.2.3 Predefined Menu

Step settings may be performed as per a predefined structure. Relevant settings are performed on the following three sub-menus specified below for predefined menu.

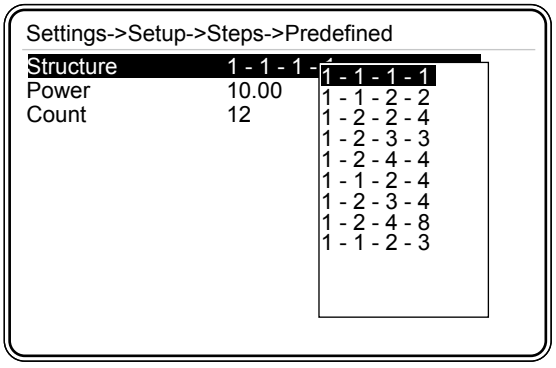


Fig. 3-22 Predefined Menu

3.2.1.2.2.3.1 Structure Menu

Following options are available on the step structure

- 1.1.1.1.1.1.1.....
- 1.1.2.2.2.2.2.....
- 1.2.2.4.4.4.4.....
- 1.2.3.3.3.3.3.....
- 1.2.4.4.4.4.4.....
- 1.1.2.4.4.4.4.....
- 1.2.3.4.4.4.4.....
- 1.2.4.8.8.8.8.....
- 1.1.2.3.3.3.3.....

3.2.1.2.2.3.2 Power Menu

Power of the first step is entered in kVAr. RAPIDUS calculates the step powers after the first step as per the selected template selected in the structure menu.

3.2.1.2.2.3.3 Number Menu

Number of steps in the template selected in structure is set in this menu.

Example:

Assume that 1.2.4.8 is selected as the structure, and 10 kVAR is entered as the power (RAPIDUS takes this value as the 1st step power), and 8 is entered as the number. Then, step powers shall be as follows:

1st step: 10 kVAR
2nd step: 20 kVAR
3rd step: 40 kVAR
4th step: 80 kVAR
5th step: 80 kVAR
6th step: 80 kVAR
7th step: 80 kVAR
8th step: 80 kVAR

3.2.1.2.2.4 Other Menu

Discharge time is entered here. RAPIDUS waits for the discharge time before reactivating a step that it has deactivated.

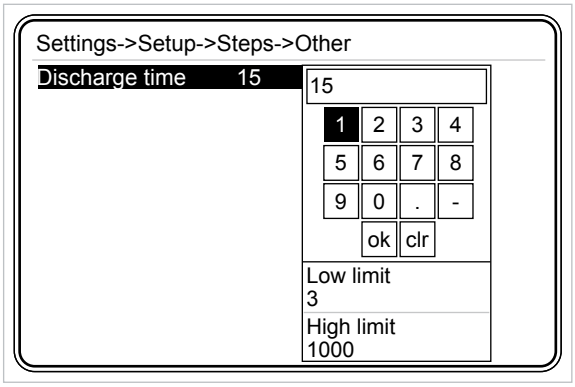


Fig. 3-23 Other Menu

3.2.1.2.3 Compensation Menu

Compensation menu is composed of the tabs shown in Fig. 3-24.

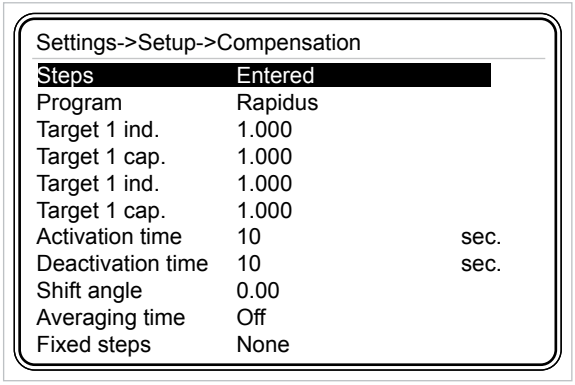


Fig. 3-24 Compensation Menu

3.2.1.2.3.1 Steps Menu

RAPIDUS activates and deactivates steps when it performs reactive power compensation. Step types and power values are determined with 3 different methods.

Entered:

User has entered step values manualy to RAPIDUS (See 3.2.1.2.2.1 Ent. Power Menu). RAPIDUS uses these values if "Entered" is selected.

Predefined:

User has entered the step power as described in predefined menu (See 3.2.1.2.2.3 Predefined). RAPIDUS uses these values if "Predefined" is selected.

DCM (Dynamic Capacitor Monitoring):

RAPIDUS follows the step values dynamically. DCM algorithm runs on the background continuously.

When user selects "DCM" option on the "Steps" tab, RAPIDUS uses the step values that it dynamically monitors and updates for compensation.

3.2.1.2.3.2 Program Menu

RAPIDUS has compensate with 6 different programs.

Rapidus Asc. Sequential, Des. Sequential, Linear and Circular options are programs with their own algorithms.

In the manual option, operator may activate and deactivate any step; RAPIDUS does nothing more than allowing manual access to the operator in this program.

Following features are available in all compensation programs other than "Manual":

- User may enter any type (capacitor or shunt reactor) and order of steps to RAPIDUS:
- RAPIDUS does not use (ignores) the steps that it has learned as "0" or that is entered by the user as "0".
- When it has learned a single- or two-phase step, if at least one step is entered as single- or two-phase by the user, RAPIDUS automatically runs on the "Rapidus" compensation program.

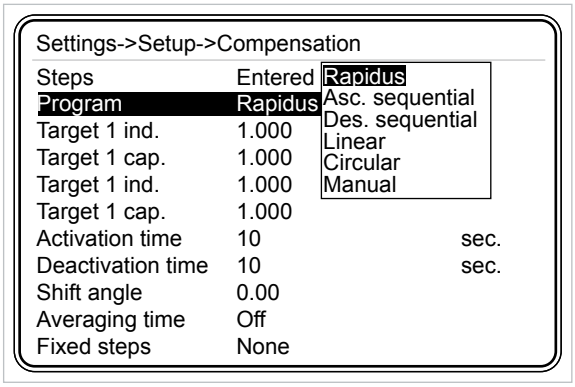


Fig. 3-25 Compensation Menu

3.2.1.2.3.2.1 Rapidus Program

"Rapidus" option is the only compensation program that allows single- or two-phase capacitors and/or single- or two-phase shunt reactor (other than "Manual")

The compensation program selected in the default settings (factory settings) of RAPIDUS is the "Rapidus" option. It activates the step combination closest to the measured demand.

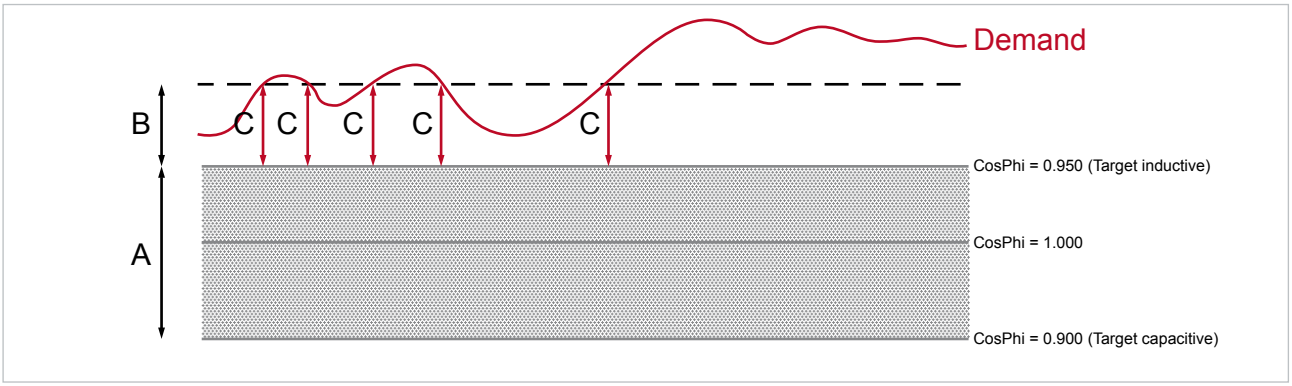


Fig. 3-26 RAPIDUS Mode Compensation Steps

On the diagram above:

A: Reactive power interval corresponding to the measured CosØ values.

B: Limit value decided for compensation by RAPIDUS (calculated as per automatic C/K ratio).

C: Reactive power value to be compensated.

When the system is in interval A, RAPIDUS does not compensate. When the system is in this interval, activation and deactivation counters of RAPIDUS are not active.

RAPIDUS starts to activate a step after an "activation time" (See 3.2.1.2.3.7 Activation time) when the system reactive power requirement reaches over B point.

Similarly, RAPIDUS starts to deactivate a step after a "deactivation time" (See 3.2.1.2.3.8 Deactivation time) when the system reactive power requirement is decreased under B point.

3.2.1.2.3.2.2 Ascending Sequential program

All steps (capacitor or reactor) shall have 3 phases in ascending sequential program.

Step activation and deactivation operations are performed by starting from the step with the lowest power (ascending sequential). When activation/deactivation is required, only one step is activated/deactivated. Then reactive power is calculated again. If activation/

deactivation demand is continued, next step with the lowest power is activated/ deactivated.

- **When the System is Inductive**

  If a shunt reactor is activated, RAPIDUS deactivates steps one by one until the demand is met starting with the shunt reactor with the lowest power.

  Assume all shunt reactors are deactivated and system is still inductive. RAPIDUS activates steps starting with the capacitor step with the lowest power.

- **When the System is Capacitive**

  If a capacitor is activated, RAPIDUS deactivates all steps one by one until the demand is met starting with the capacitor with the lowest power.

  Assume all capacitors are deactivated and system is still capacitive. RAPIDUS activates steps starting with the shunt reactor step with the lowest power.

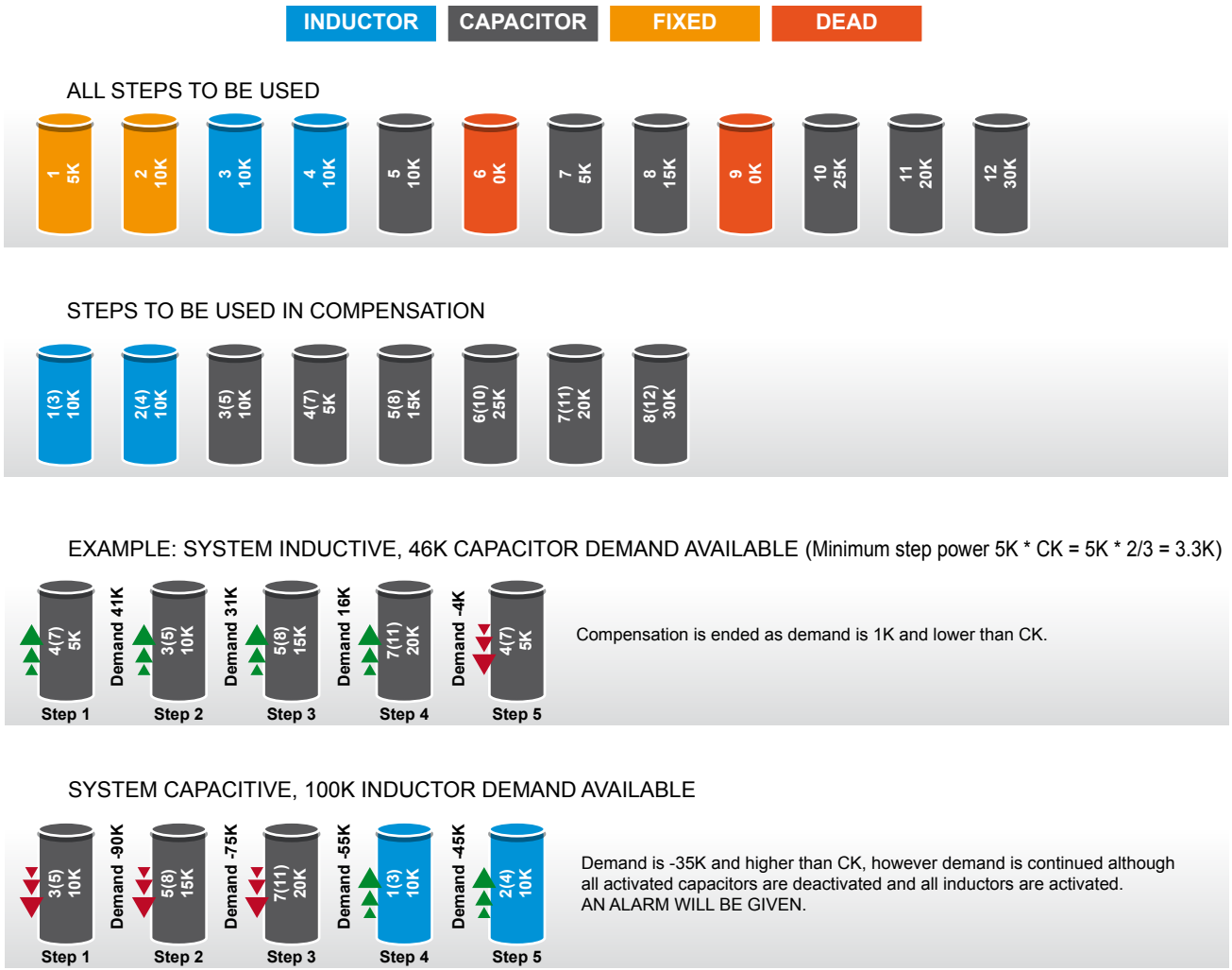


Fig. 3-27 RAPIDUS Asc. Sequential Mode

3.2.1.2.3.2.3 Descending Sequential Mode

All steps (capacitor or reactor) shall have 3 phases in descending sequential program.

RAPIDUS performs activation/deactivation operation starting with the step closest to the demand. When activation/deactivation is required, only one step is activated/deactivated. Then reactive power is calculated again. If activation/deactivation demand is continued, next step closest to the demand is activated/deactivated.

- **If the System is Inductive:**

  If a shunt reactor is activated, steps are deactivated one by one until the demand is met starting with the shunt reactor closest to the demand.

  If system is still inductive although all shunt reactors are deactivated, and there are capacitor steps that are not active, steps are activated one by one until the demand is met starting with the capacitor step closest to the demand.

- **If the System is Capacitive:**

  If a capacitor is activated, steps are deactivated one by one until the demand is met starting with the capacitor closest to the demand.

  If system is still capacitive although all capacitors are deactivated, and there are shunt reactor steps that are not active, steps are activated one by one until the demand is met starting with the shunt reactor step closest to the demand.

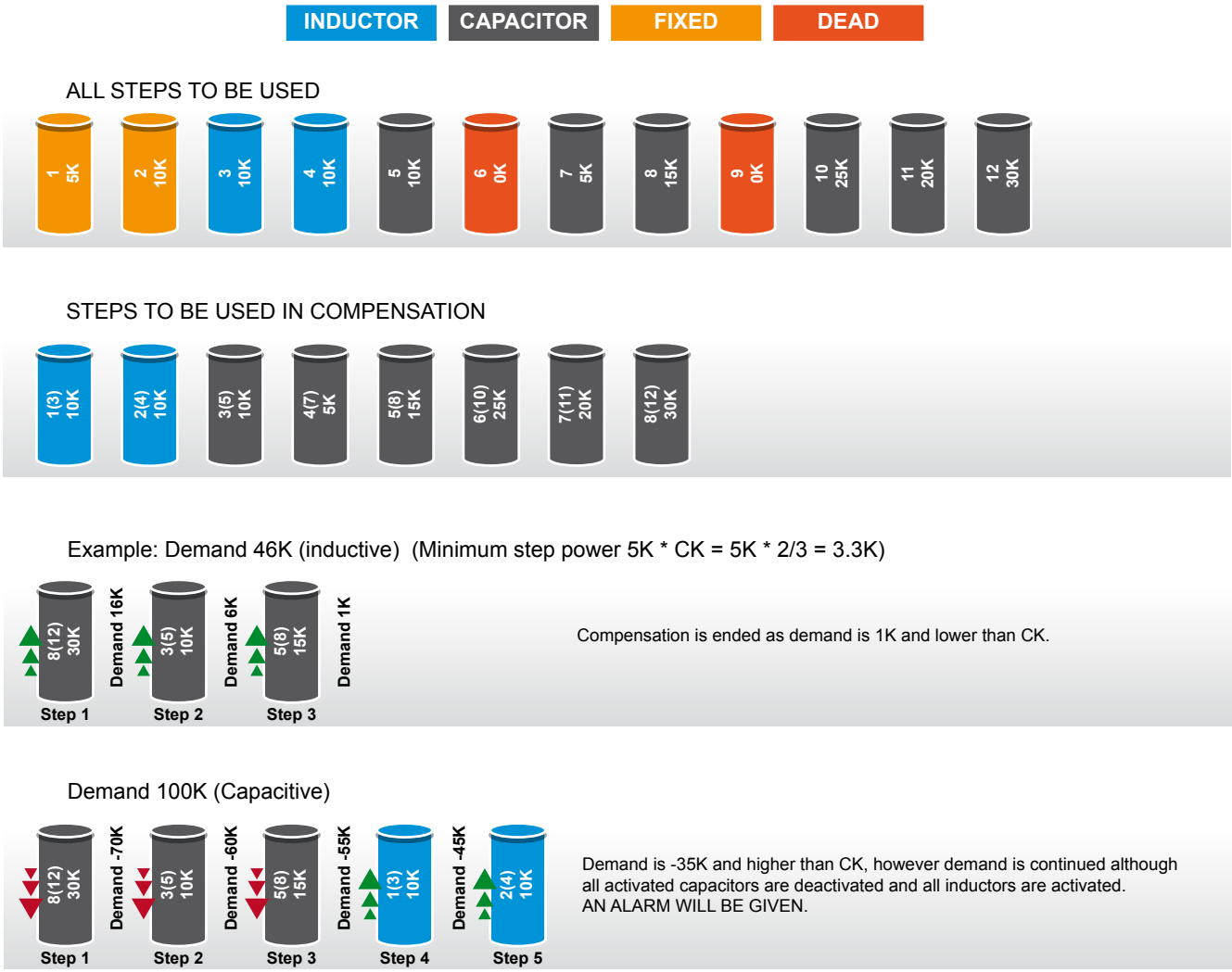


Fig. 3-28 RAPIDUS Des. Sequential Mode

3.2.1.2.3.2.4 Linear Mode

All steps (capacitor or reactor) shall have 3 phases in linear program.

Linear program is used in panels with the step structure 1.1.1.1.

The step activated first is deactivated last in linear program.

- **If the System is Inductive:**

  If there are shunt reactors activated, the number of shunt reactors that will the demand shall be deactivated. If the system is still inductive although all shunt reactors are deactivated, the number of capacitors required shall be activated.

- **If the System is Capacitive:**

  If there are capacitors activated, the number of capacitors that will the demand shall be deactivated. If the system is still capacitive although all capacitors are deactivated, the number of shunt reactors required shall be activated.

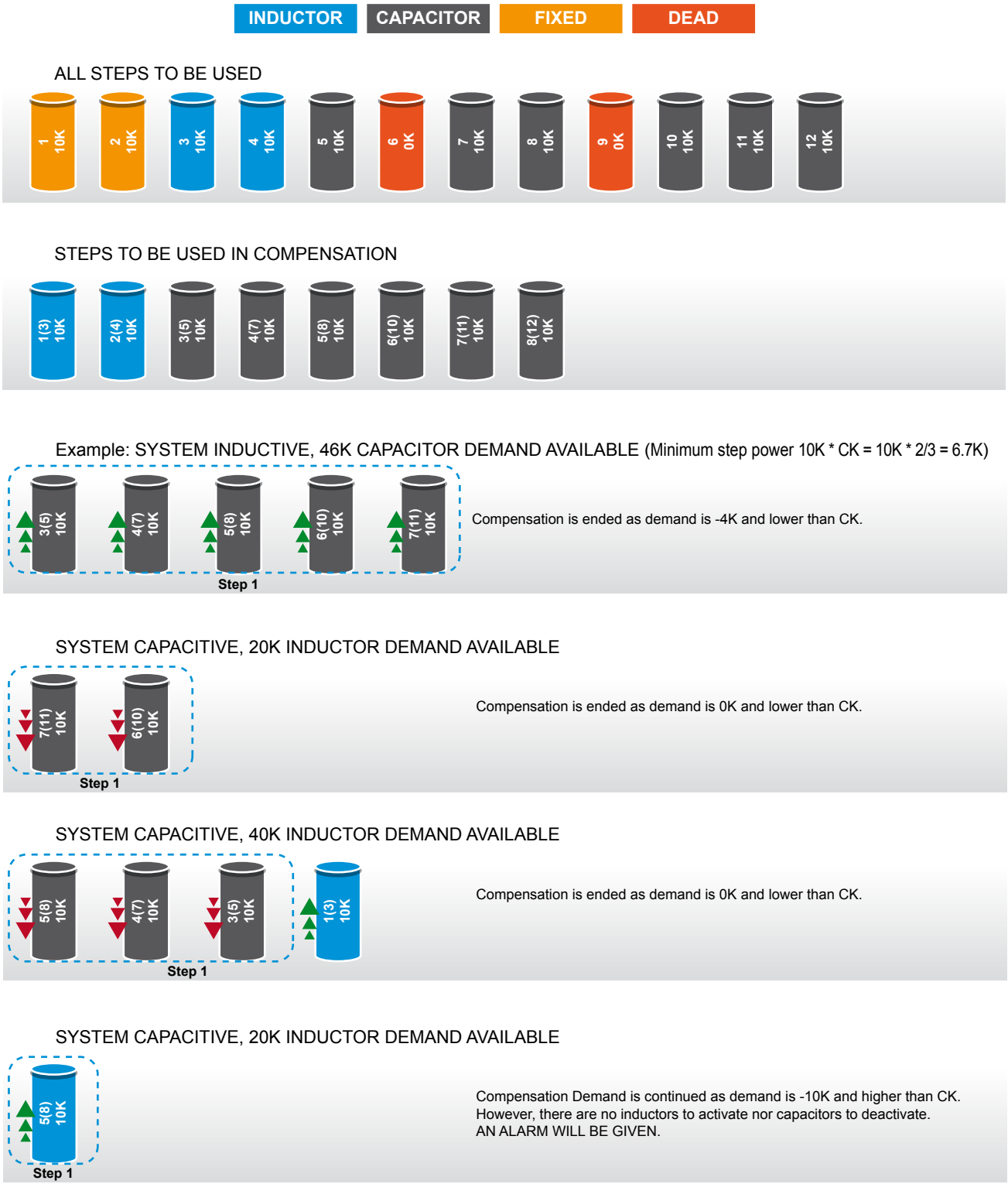


Fig. 3-29 RAPIDUS Linear Mode

3.2.1.2.3.2.5 Circular Mode

All steps (capacitor or reactor) shall have 3 phases in circular program.

Circular program is used in panels with the step structure 1.1.1.1.

The step activated first is deactivated first in circular program.

- **If the system is inductive:**

  If there are shunt reactors activated, the number of shunt reactors that will the demand shall be deactivated. If the system is still inductive although all shunt reactors are deactivated, the number of capacitors required shall be activated.

- **If the system is capacitive:**

  If there are capacitors activated, the number of capacitors that will the demand shall be deactivated. If the demand is resumed although all capacitors are deactivated, the number of shunt reactors required shall be activated.

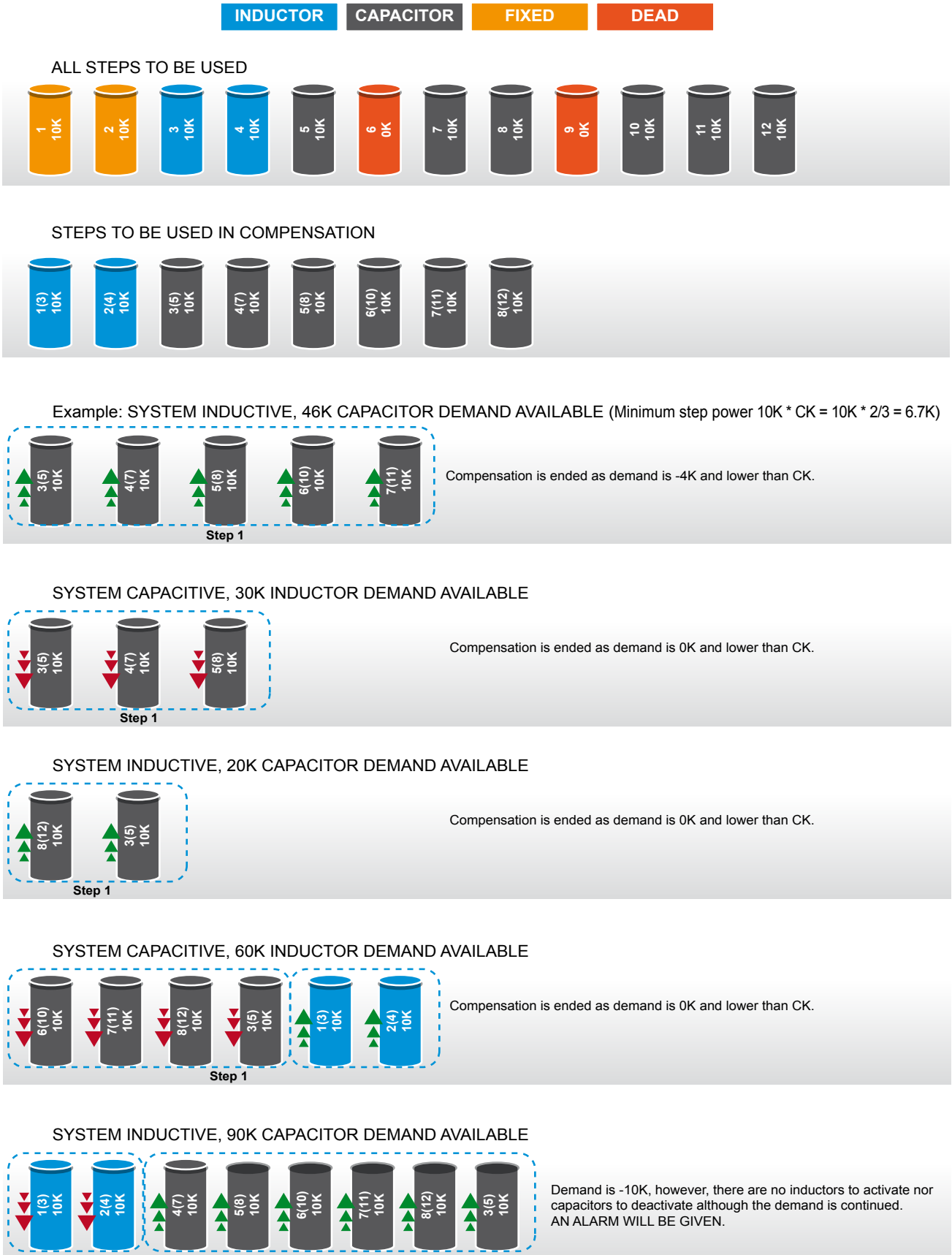


Fig. 3-30 RAPIDUS Circular Mode

3.2.1.2.3.2.6 Manual program

RAPIDUS does not perform automatic compensation when it is taken in manual mode.

When manual program is active, a “hand” symbol is displayed on the lower left corner of the main menu page. This symbol indicates that RAPIDUS is in manual compensation mode.

Manual mode is activated by pressing down arrow when you are in main menu screen. The step that shall be activated is highlighted with arrow keys and OK key is pressed. Thus, step shall be activated. Step shall be deactivated when you highlight the step that will be deactivated and press OK. If an hourglass symbol is displayed while the step is being activated, this indicates that discharge time is waited to activate the step.

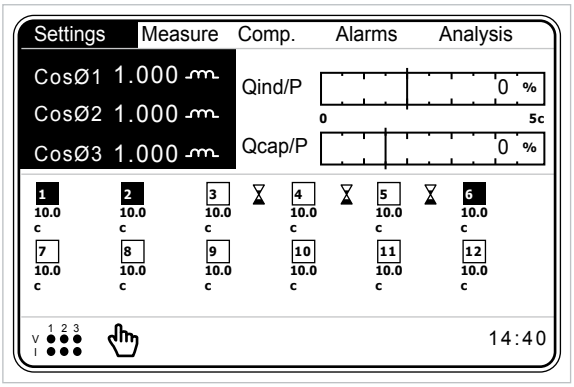


Fig. 3-31 Manual Mode Menu

3.2.1.2.3.3 Target 1 Inductive Menu

Target inductive CosØ value is set here. Inductive cosØ target value may be set between 0.800 and 1.000.

3.2.1.2.3.4 Target 1 Capacitive Menu

Target capacitive CosØ value is set here. Capacitive cosØ target value may be set between 0.800 and 1.000.

3.2.1.2.3.5 Target 2 Inductive Menu

RAPIDUS may also compensate as per a secondary cosØ value. For this feature to be active:

- Operator should change Mod tab of “Settings->Setup->Aux. input” setting to either of the following
  - Night/day
  - Generator
- GEN input should be activated

Inductive target 2 may be set between 0.800 and 1.000.

3.2.1.2.3.6 Target 2 Capacitive Menu

RAPIDUS may also compensate as per a secondary cosØ value. For this feature to be active:

- Operator should change Mod tab of "Settings->Setup->Aux. input" setting to either of the following
  - Night/day
  - Generator
- GEN input should be activated

Capacitive target 2 may be set between 0.800 and 1.000.

3.2.1.2.3.7 Activation Time Menu

RAPIDUS waits for the "activation time" before activating a step. Activation time may be selected between 1 and 600 seconds.

3.2.1.2.3.8 Deactivation Time Menu

RAPIDUS waits for the "deactivation time" before deactivating a step. Deactivation time may be selected between 1 and 600 seconds.

3.2.1.2.3.9 Shift Angle Menu

By entering the shift angle, changes in reactive power (transformer losses) that occur before the RAPIDUS measurement point are compensated.

Shift angle is set from -45° to 45°. RAPIDUS adds the reactive power that is calculates with the shift angle to the reactive power that it calculates by measuring the system voltage and current. Then it calculates the cosØ value and compensates.

Index values vary as per shift angle.

Example 1:

Assume that the CosØ value indicated by RAPIDUS is 1.000.

When the user enters 20° as the shift angle, RAPIDUS shall calculate CosØ value as 0.940 inductive.

When the user enters -30° as the shift angle, RAPIDUS shall calculate CosØ value as 0.866 capacitive.

3.2.1.2.3.10 Averaging Time

RAPIDUS compensates by averaging the system by the set time. This set time ensures compensating by switching less steps in systems with less load changes.

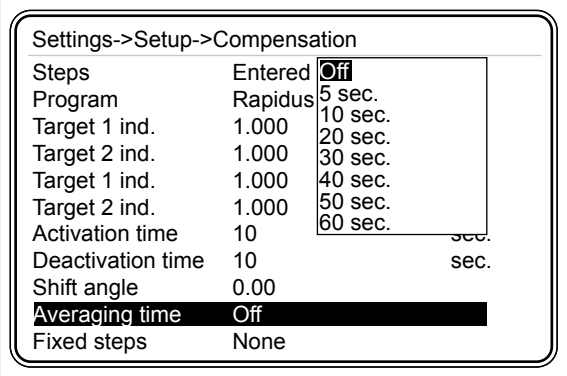


Fig. 3-32 Averaging Time Menu

3.2.1.2.3.11 Fixed Steps Menu

First three steps of RAPIDUS may be assigned as fixed steps. On the main menu screen, "↕" symbol is displayed next to the step assigned as fixed symbol.

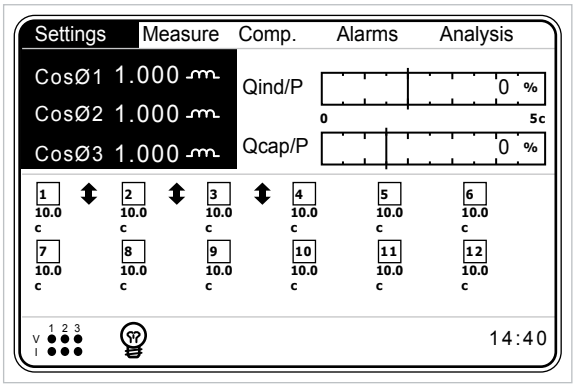


Fig. 3-33 Fixed Steps Menu

3.2.1.2.4 Learn Menu

Settings for learning of steps and connections by RAPIDUS are performed from this menu.

3.2.1.2.4.1 Learn Conn. Menu

Settings for learning of current and voltage connections by RAPIDUS are performed here.

3.2.1.2.4.1.1 Learn at start

On => RAPIDUS learns connections automatically when it is turned on or restarted.
Off => RAPIDUS does not learn connections automatically when it is turned on or restarted.

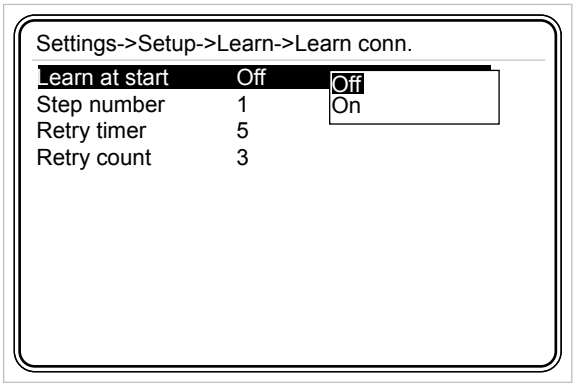


Fig. 3-34 Connection Setup

If the connections shall not be learned at start up, we advise them to be learned manually. This procedure is performed at "Compensation->Learn conn." menu. (See 3.2.3.4 Learn Conn. Menu)

Factory setting for connections is V1, V2, V3, I1, I2 and I3. RAPIDUS shall take a measurement with this combination in the initial start.

Current transformers may operate correctly when a current more than a certain value is taken from their secondary coils by their nature. For a system where current transformer ratio (CTR) is 1, phase currents shall exceed 250 mA to ensure RAPIDUS starts to learn the connections. If the current of any phase is lower than 250mA; RAPIDUS cannot learn a connection automatically.

When the RAPIDUS is turned on, if phase currents are higher than 250mA and active power is negative, it shall consider the connections as incorrect. Then, it shall run the learn connections algorithm.

Assume that phase connections are higher than 250mA. Even if the RAPIDUS connections are made incorrectly, there may be conditions that active powers are positive. In these cases, RAPIDUS shall consider the connections as correct and shall not run learn connections algorithm. Therefore, it is important that connections are checked by the operator.

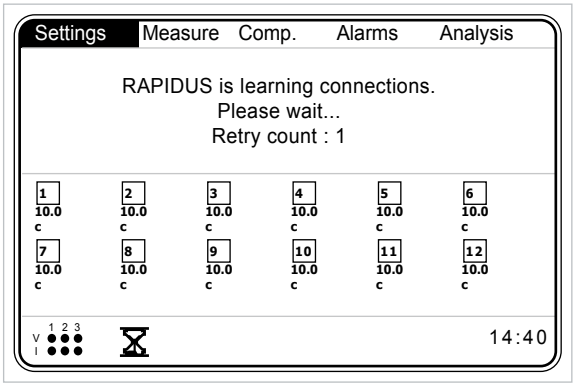


Fig. 3-35 Learning Connections at the Startup

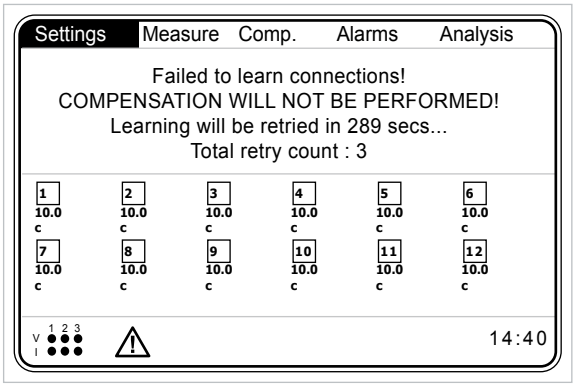


Fig. 3-36 Waiting Time After Unsuccessful Connection Learning

3.2.1.2.4.1.2 Step number

RAPIDUS learns the connections by activating a 3-phase capacitor.

We advise you to enter the step number that the capacitor with the highest power value is connected.

If the number of a step that is determined as faulty by RAPIDUS is entered to "Step number" setting, an error/warning message shall be displayed on the screen.

3.2.1.2.4.1.3 Retry Timer

If RAPIDUS could not learn the connection after making retries equal to the "Retry number", it waits for the set retry timer without compensating. Then (after the "Retry timer"), it tries to learn the connections. This cycle is continued until the connections are learned.

While waiting for the "Retry timer", RAPIDUS continues to make measurements and display these measurements on its screen, but it does not compensate.

If user does not want to wait during the retry timer, he/she can manually command from "Comp.->Learn conn.".

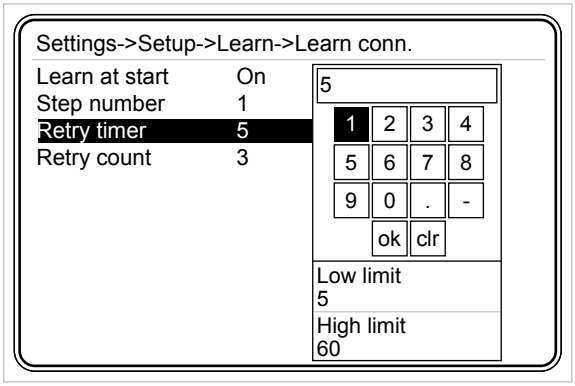


Fig. 3-37 Retry Timer

3.2.1.2.4.1.4 Retry Number

When it cannot learn the connection at startup, RAPIDUS it tries to learn the connections for times equal to the "Retry Number".

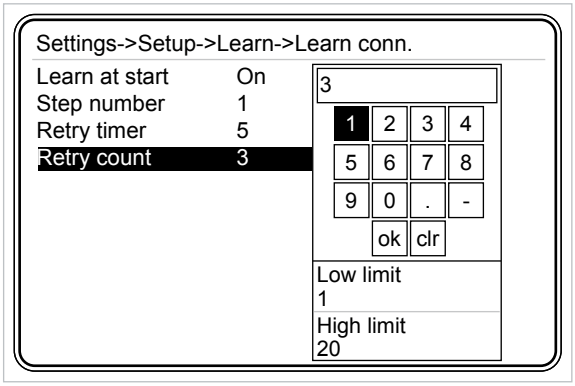


Fig. 3-38 Retry Number

3.2.1.2.4.2 Aux. Input Menu

Aux. input menu is used to ensure that, RAPIDUS compensates as per the secondary target cosØ.

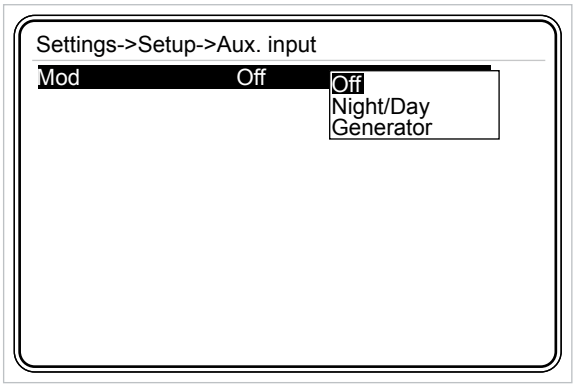


Fig. 3-39 Aux. Input

3.2.1.2.4.3 Off mode

If the digital input mode is selected as "Off", GEN input shall not affect running of RAPIDUS. RAPIDUS compensates as per "Target 1 Inductive" and "Target 1 Capacitive" values.

3.2.1.2.4.4 Night/Day Mode

If aux. input mode is selected as "Night/Day", compensation is performed as per "Target 2 Inductive" and "Target 2 Capacitive" values when GEN input is active. Energy menu counters count independent of the GEN input.

3.2.1.2.4.5 Generator Mode

If aux. input mode is selected as "Generator", compensation is performed as per the set "Target 2 Inductive" and "Target 2 Capacitive" values when GEN input is active. Then, energy menu counters (See 3.2.2.2 Energy Menu) do not count.

3.2.1.2.5 Device Menu

This menu is used for performing the following settings.

- Language
- Contrast
- Pass. protection
- New password
- Display on
- Display on time

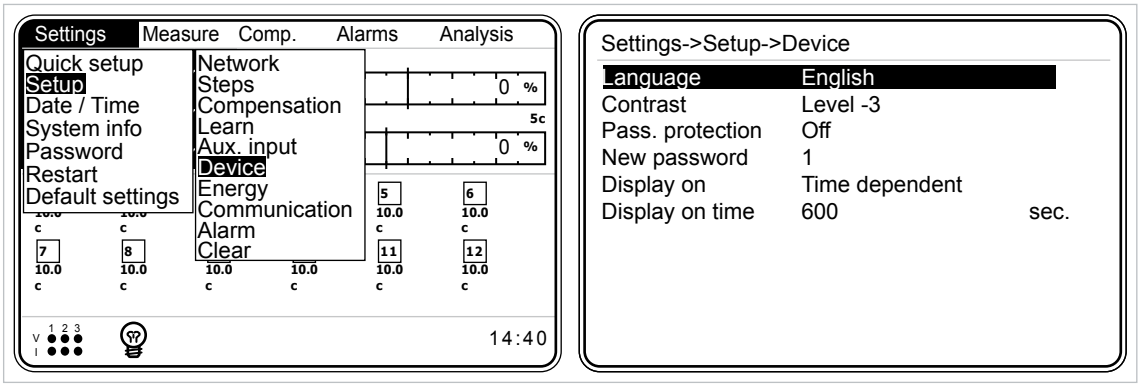


Fig. 3-40 Device Menu

3.2.1.2.5.1 Language Setting

- Türkçe
- English
- Русский

User shall select the desired setting with up and down arrows and press "OK".

3.2.1.2.5.2 Contrast Setting

This menu is used for performing the contrast setting. Level setting steps are displayed when you press OK when this option selected. User shall select the desired contrast level with up and down arrows and press "OK". RAPIDUS screen gets darker when you go up to level 4. RAPIDUS screen gets lighter when you go down to level -4.

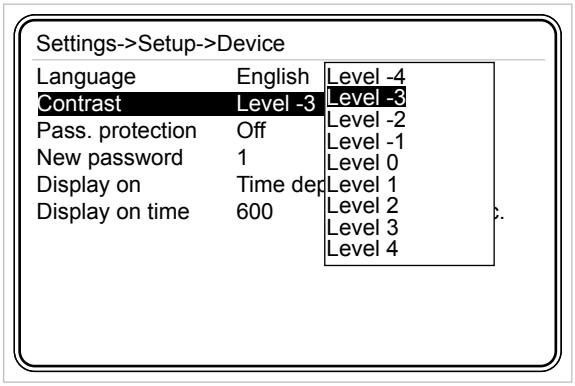


Fig. 3-41 Contrast Setting

3.2.1.2.5.3 Pass. Protection

If password protection is selected as "On", you shall enter a password in order to enter the setting menus each time RAPIDUS is restarted again.

If password protection is selected as "Off", you do not need to enter a password in order to enter the setting menus each time RAPIDUS is restarted again.

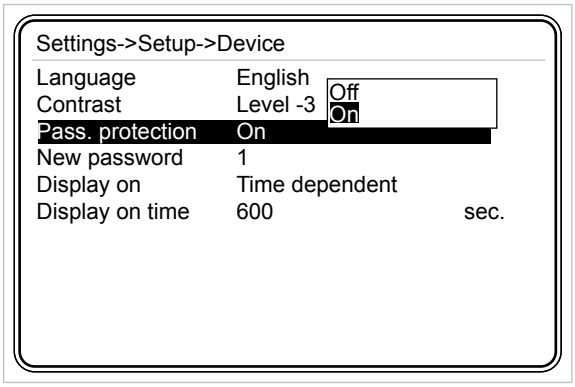


Fig. 3-42 Pass. Protection

3.2.1.2.5.4 New Password Setting

Factory set password of RAPIDUS is "1". New password may be selected between 1 and 9999. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

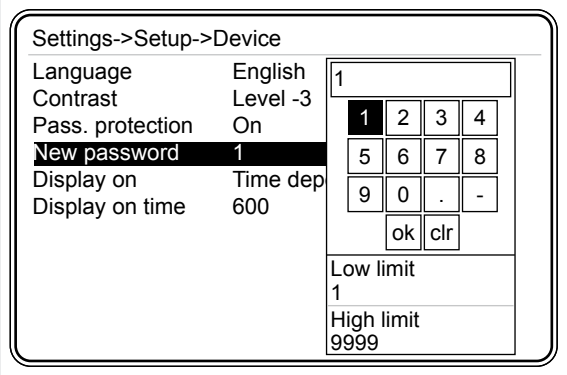


Fig. 3-43 New Password Entry

3.2.1.2.5.5 Display On Setting

- Continuous
- Time dependent

When continuous is selected, the backlight of RAPIDUS display does not turn off. When time dependent is selected, screen backlight is turned on for "display on time".

3.2.1.2.5.6 Display On Time Setting

This tab is used for setting the on time for the backlight of RAPIDUS display. It may be selected between 10 and 600 seconds. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

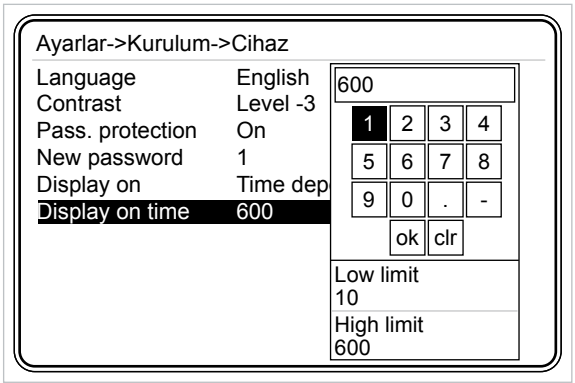


Fig. 3-44 Display On Time Setting

3.2.1.2.6 Energy Menu

This menu is used for entering the initial energy values. The settings in this menu are used for synchronization of system electricity counter and RAPIDUS counters. User shall select the desired energy value with up and down arrows and press "OK".

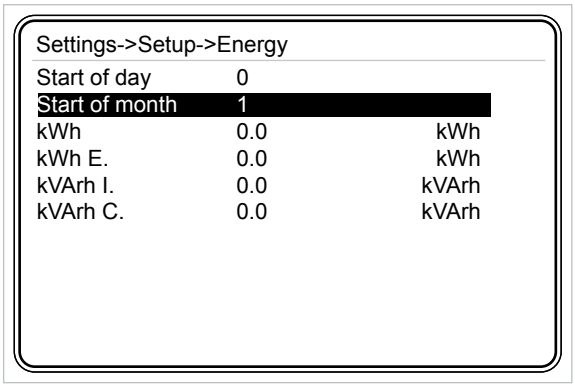


Fig. 3-45 Energy Menu

3.2.1.2.6.1 Start of day setting

This is the settings tab for entering the time for start of the day. Start of the day time may be selected between 0 and 23. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

3.2.1.2.6.2 Start of month setting

This is the settings tab for entering the day for start of the month. Start of month day may be selected between 1 and 28. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

The settings listed below between 3.2.1.2.6.3 and 3.2.1.2.6.6 are used for synchronization of system electricity counter and RAPIDUS counter. Each of them may be set between 0.0 and 20000000000.0. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

3.2.1.2.6.3 kWh Setting

This tab is used for entering the "initial" value for imported active energy.

3.2.1.2.6.4 kWh E. Setting

This tab is used for entering the "initial" value for exported active energy.

3.2.1.2.6.5 kVArh I. Setting

This tab is used for entering the "initial" value for inductive reactive energy.

3.2.1.2.6.6 kVArh C. Setting

This tab is used for entering the "initial" value for capacitive reactive energy.

3.2.1.2.7 Communication Menu

RAPIDUS includes Modbus RTU communication protocol. Settings related with Modbus protocol are made in this menu.

3.2.1.2.7.1 Baud Rate Menu

User shall select the desired value with up and down arrows and press "OK". RAPIDUS communicates with speeds of 2400, 4800, 9600, 19200, 38400 and 57600 bits/second.

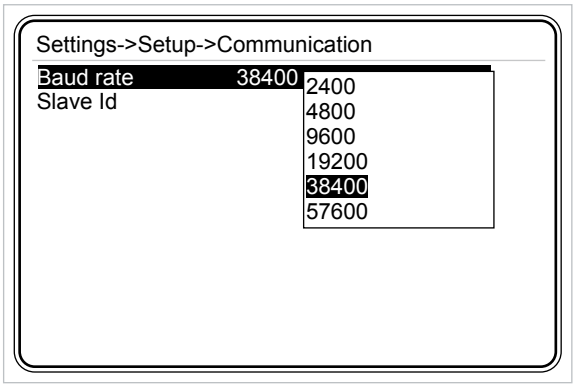


Fig. 3-46 Baud Rate Setting

3.2.1.2.7.2 Slave Id Menu

This is the settings tab for entering the slave id number. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

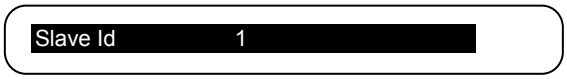


Fig. 3-47 Slave Id Setting

Maximum 247 devices may communicate over the same RS485 line. Therefore, slave id may be selected between 1 and -247.

3.2.1.2.8 Alarm Menu

User may navigate in the alarm settings menu using up and down arrow keys, and access the contents of the sub-menus of alarm menu by pressing OK.

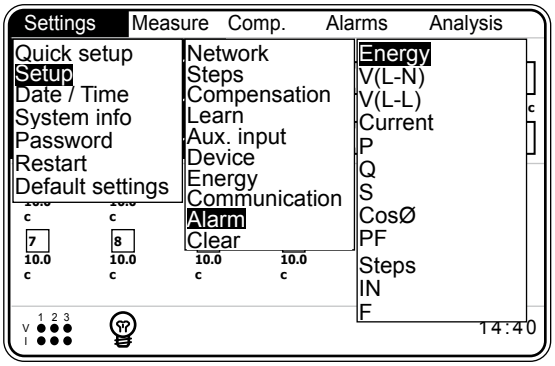


Fig. 3-48 Alarm Menu

3.2.1.2.8.1 Energy Alarm Menu

This menu is used for performing the upper limit alarm settings of Inductive/Active and Capacitive/Active ratios. User may navigate in Energy alarms menu with up and down arrows.

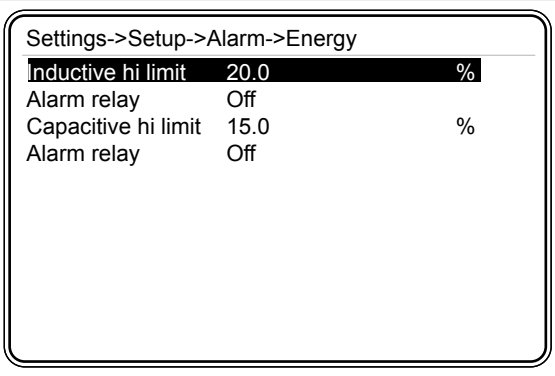


Fig. 3-49 Energy Menu

$$\text{Inductive hi limit} = \frac{\text{Inductive reactive energy}}{\text{Active energy}} \times 100$$

$$\text{Capacitive hi limit} = \frac{\text{Capacitive reactive energy}}{\text{Active energy}} \times 100$$

Refer to descriptions of V(L-N) Alarm menu for the alarm relay setting.

3.2.1.2.8.2 V(L-N) Alarm Menu

This sub-menu is used for phase-neutral voltage alarm settings. User may navigate in V(L-N) alarms menu with up and down arrows.

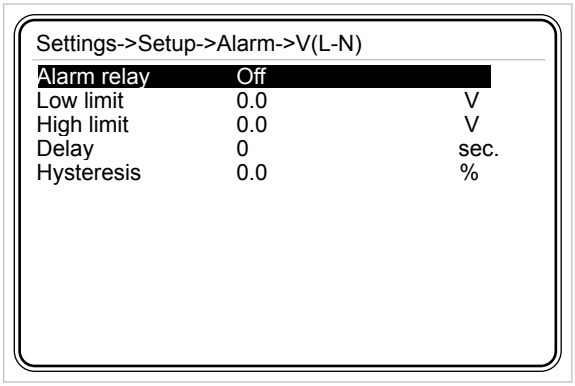


Fig. 3-50 V(L-N) Alarm Menu

Alarm relay:

This setting is used for regulation of pulling of the relays when an alarm occurred only. In order to ensure that RAPIDUS gives a V (L-N) alarm, lower and upper limit values shall be set as described below.

Alarm relay options:
Off: No alarm relay is pulled in case of an alarm
Relay1 : Only relay 1 is pulled in case of an alarm
Relay2 : Only relay 2 is pulled in case of an alarm

User shall select the desired setting with up and down arrows and press "OK".

Fig. 3-51 Alarm Relay Setting

If V(L-N) in any of three phases goes out of low or high limit, RAPIDUS gives an alarm.

Low Limit:

This tab is used for entering alarm low limit. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.). In order to set an alarm for V (L-N) values, user shall enter a smaller low limit than high limit. If low limit and high limit values entered are the same, V(L-N) parameter is closed for alarms.

High Limit:

This tab is used for entering alarm high limit. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.). In order to set an alarm for V (L-N) values, user shall enter a higher high limit than low limit. If low limit and high limit values entered are the same, V(L-N) parameter is closed for alarms.

Delay:

RAPIDUS waits for the delay time before giving an alarm when the related alarm parameter exceeds “Low limit” or “High limit” value. Also, RAPIDUS waits for the delay time again before cancelling an alarm condition when the related alarm parameter returns back in the limits. It may be selected between 0 and 600 seconds. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

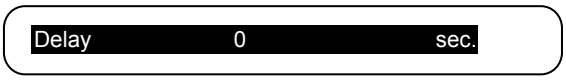


Fig. 3-52 Alarm Time Setting

Hysteresis setting:

This is the tolerance value entered in %. Refer to the example below and Fig. 3-51 for the usage method. It may be selected between 0.0 and 20.0. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

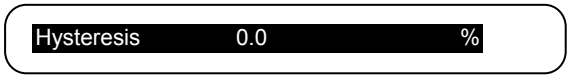


Fig. 3-53 Hysteresis Setting

Example:

For the figure below (delay setting is zero):

An alarm occurs in point A
Alarm is cancelled in point B
An alarm occurs in point C
Alarm is cancelled in point D

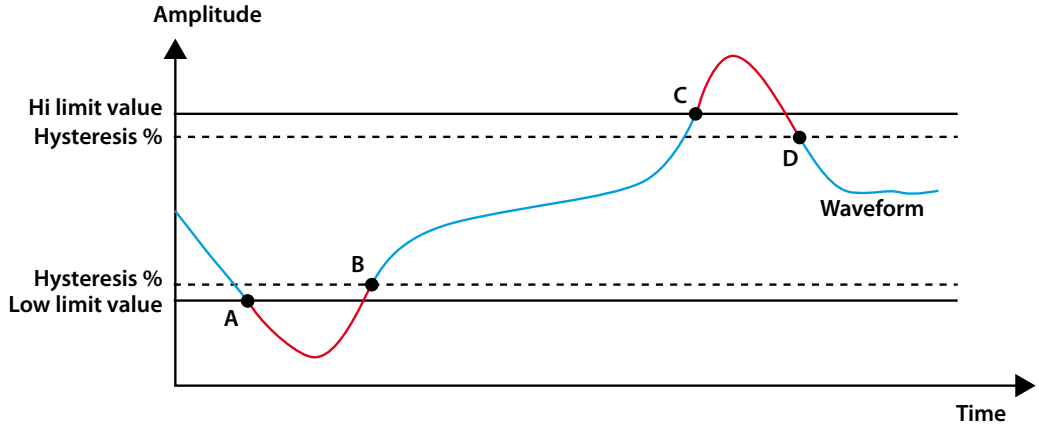


Fig. 3-54 Alarm Example

3.2.1.2.8.3 V(L-L) Alarm Menu

This sub-menu is used for phase-phase voltage alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (V(L-L) low and high limit values: 0.0↔2600000.0).

3.2.1.2.8.4 Current Alarm Menu

This sub-menu is used for current alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (Current low and high limit values: 0.0↔30000.0)

3.2.1.2.8.5 P Alarm Menu

This sub-menu is used for active power alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (P low and high limit values: -10000000000.0↔ 10000000000.0)

3.2.1.2.8.6 Q Alarm Menu

This sub-menu is used for reactive power alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (Q low and high limit values: -10000000000.0↔ 10000000000.0)

3.2.1.2.8.7 S Alarm Menu

This sub-menu is used for apparent power settings. Settings are the same for the settings for Alarm->V(L-N) menu. (S low and high limit values: 0.0↔10000000000.0)

3.2.1.2.8.8 CosØ Alarm Menu

This sub-menu is used for CosØ alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (CosØ low and high limit values: 0.000↔1.000).

3.2.1.2.8.9 PF Alarm Menu

This sub-menu is used for power factor alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (PF low and high limit values: 0.000↔1.000)

3.2.1.2.8.10 Step Alarm Menu

This sub-menu is used for step alarm settings. RAPIDUS gives an alarm when any of the steps used in compensation gets lower than the value calculated with the “low limit” setting (alarm limit).

$$\text{Alarm limit} = \frac{\text{initial value x Low limit}}{100}$$

(Step low limit values: 20.0↔100.0)

3.2.1.2.8.11 IN Alarm Menu

This sub-menu is used for neutral current alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (IN high limit values: 0.000↔30000.000)

3.2.1.2.8.12 F Alarm Menu

This sub-menu is used for frequency alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (Frequency low and high limit values: 35.0↔70.0)

3.2.1.2.8.13 V Harmonics Alarm Menu

This sub-menu is used for harmonics alarm settings. User shall select the desired tab with up and down arrows and press "OK".

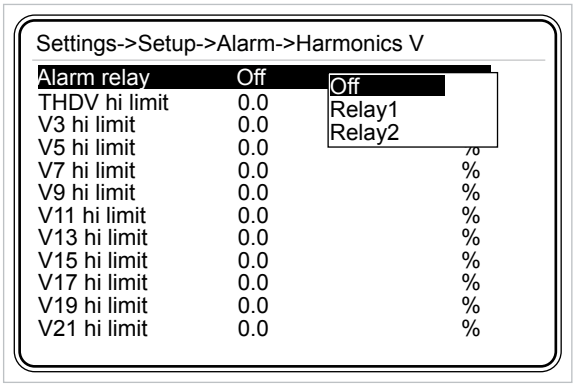


Fig. 3-55 V Harmonics Alarm Menu

Alarm relay:

Refer to 3.2.1.1.8.1 V(L-N) - Alarm relay.

THDV High Limit:

This is used for entering high limit value of total harmonic distortion in the voltage. In order to set a THDV alarm, user shall enter a number higher than zero as THDV high limit. If zero is entered as the high limit value, THDV parameter is turned off for alarms.

It may be selected between 0.0 and 100.0. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

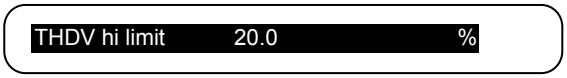


Fig. 3-56 THDV High Limit Setting

V3 --- V21 high limit:

This is used for entering high limit value of "3rd", "5th" … "21st" harmonic distortion in the voltage. In order to set a V3, V5 – V21 harmonic alarm, user shall enter a number higher than zero as high limit. If zero is entered as the high limit value, V3, V5 – V21 parameters are turned off for alarms.

It may be selected between 0.0 and 100.0. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.)

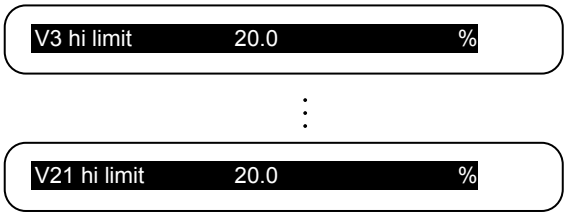


Fig. 3-57 V3-V21 Harmonics High Limit Setting

Delay:

Refer to 3.2.1.1.8.1 V(L-N) – Delay.

3.2.1.2.8.14 I Harmonics Alarm Menu

Settings for the "I harmonics" alarms are the same for the settings for "V harmonics".

3.2.1.2.8.15 Temperature Alarm Menu

This sub-menu is used for temperature alarm settings. Settings are the same for the settings for Alarm->V(L-N) menu. (Temperature low and high limit values: It may be selected between -20.0 and 80.0).

If low limit and high limit values entered are the same, RAPIDUS does not give an alarm.

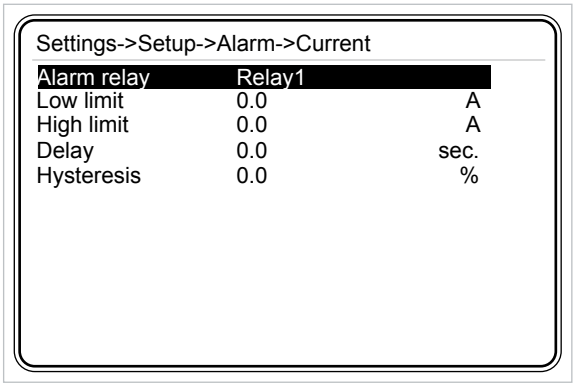


Fig. 3-58 No Alarm Time Condition

If low limit entered is higher than the high limit, “Invalid limits! Please check” message is displayed on RAPIDUS screen.

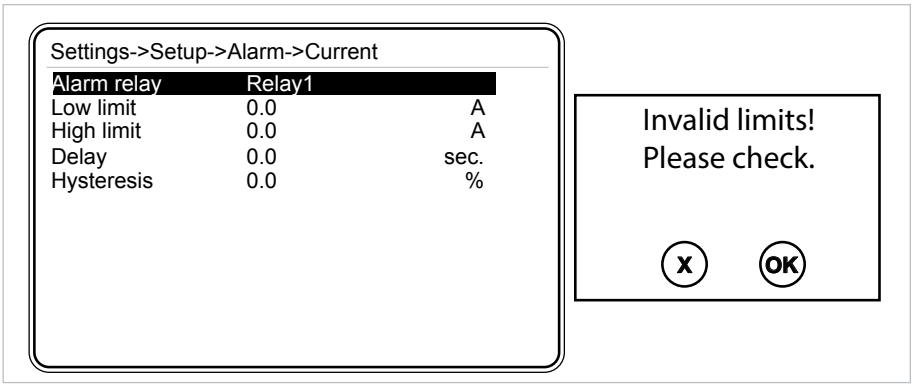


Fig. 3-59 Invalid Limit

3.2.1.2.9 Clear Menu

Sub menus are displayed when you press OK when the Clear option selected. User shall select the tab to be cleared with up and down arrows and press “OK”. Relevant clearing operation is performed if you press OK when “Are you sure?” message is displayed on the screen; and it returns back without clearing when you press X.

Energy and demand values are cleared. Learned connections are returned back to factory presets.

All tab performs all of the three operations above.

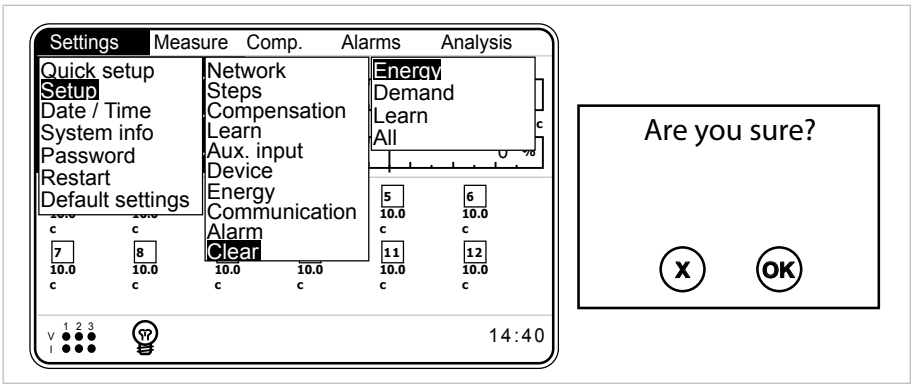


Fig. 3-60 Clear Menu

Assume that for a RAPIDUS used for some time, “Measure->Energy->Imp. Active” sub menu is like the one in Fig. 3-59.

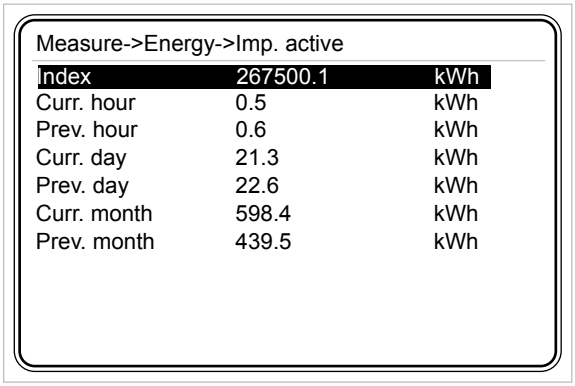


Fig. 3-61 Before Clearing

After the clearing operation is completed, "Measure->Energy->Imp. Active" sub menu shall be like the one in Fig. 3-60.

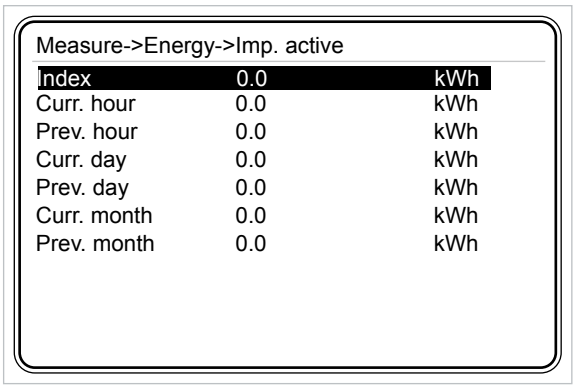


Fig. 3-62 After Clearing

After the clearing operation, a number different than zero may be seen for index parameters. This number is the initial value entered by the user for the relevant index parameter.

For example, assume that initial value for "Setup->Energy->T1 kWh" is entered as 7500 kWh. Then, after the clearing operation is completed, "Counters->Rate 1->Imp. Active->Index" value shall be 7500 kWh. (See Fig. 3-61)

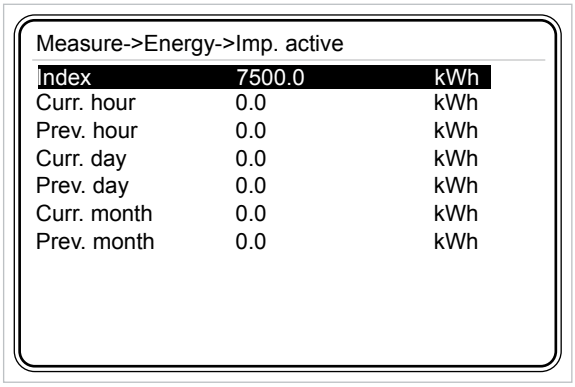


Fig. 3-63 Initial Value Entered After Clearing

3.2.1.3 Date/Time Menu

Date/Time is set in this menu. (For RAPIDUS Date/Time Setting, Refer to 3.1.4 Ex.).

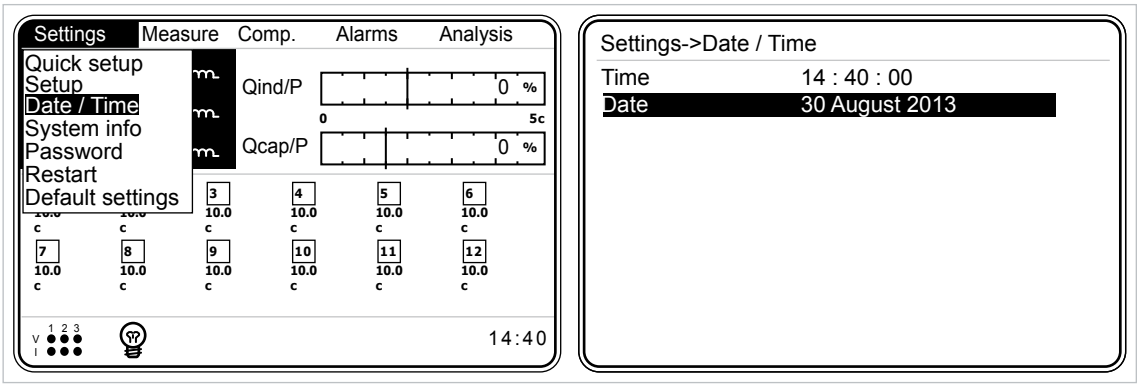


Fig. 3-64 Date/Time Menu

3.2.1.4 System Info Menu

No setting is performed in this menu, it is just for informational purposes.

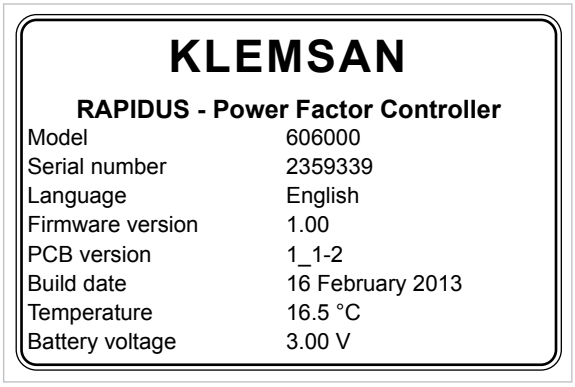


Fig. 3-65 System Info

Temperature and battery voltage values may be read via RS485.

3.2.1.5 Password Menu

If no password is entered, only Date/Time, System Info and Password tabs shall be active under settings menu. You shall enter a password in order to activate the other tabs.

"Login success" shall be displayed if the password entered is correct; and "Password mismatch" message shall be displayed if it is incorrect. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

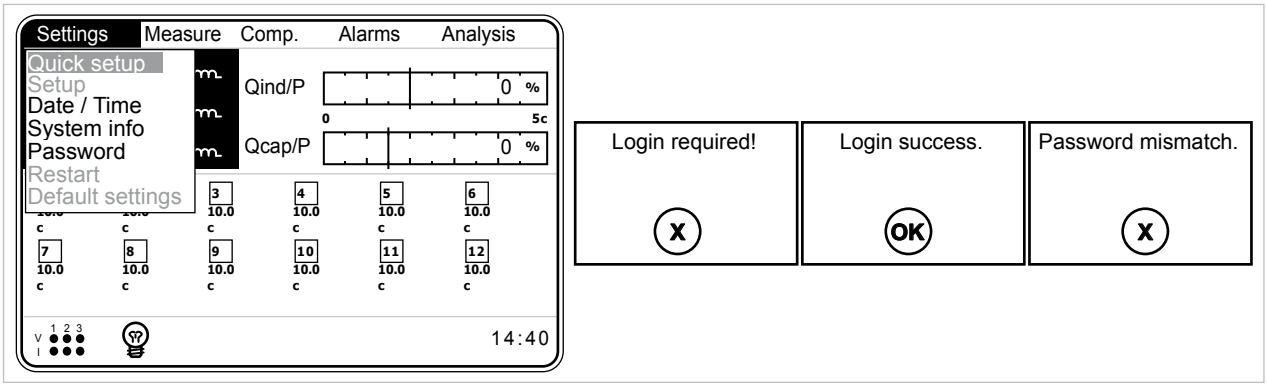


Fig. 3-66 Password

3.2.1.6 Restart Menu

This is used for restarting RAPIDUS. "Are you sure?" message shall be displayed if you press OK when the Restart tab is highlighted. RAPIDUS is restarted by pressing OK again.

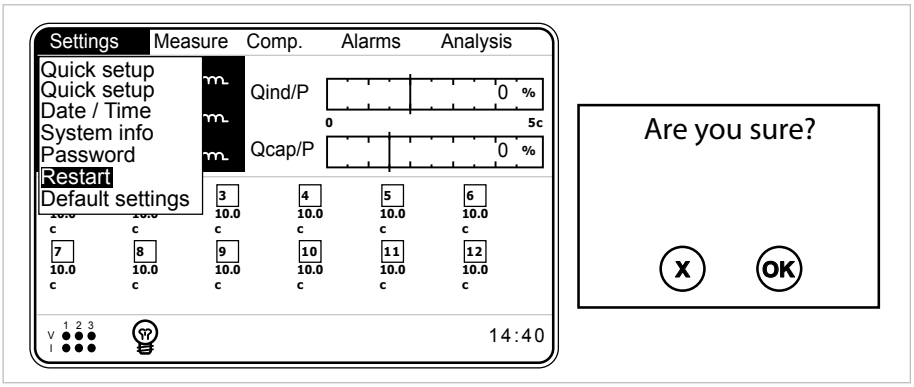


Fig. 3-67 RAPIDUS Restart

3.2.1.7 Default Settings

Default settings menu is used to return back to factory settings. After this operation, all settings other than date and time are returned back to factory settings.

Note: Index values are not reset after this operation.

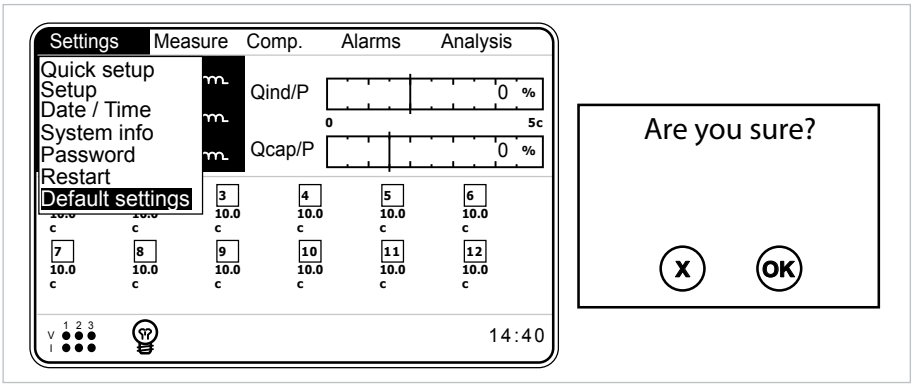


Fig. 3-68 Default Settings

3.2.2 Measure Menu

Sub-menus below are available under the measurements menu. User shall select the desired tab with up and down arrows and press "OK".

- Instantaneous
- Energy
- Demand
- Phasor diagram
- Harmonics

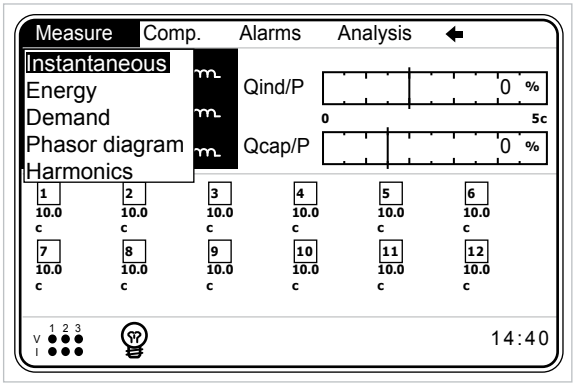


Fig. 3-69 Measure Menu

3.2.2.1 Instantaneous Menu

Instantaneous measurement values are available in this menu. Page in fig. 3-68 shall be displayed when OK is pressed while Measure menu, Instantaneous tab is highlighted. Instantaneous measurement parameters listed below are monitored using the right and left arrow keys.

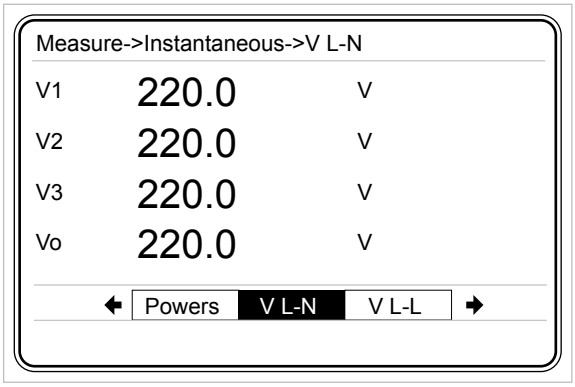


Fig. 3-70 Instantaneous Menu

- Phase voltage (L-N) values and average voltage (L-N) value
- Phase voltage (L-L) values and average voltage (L-L) value
- Phase currents total current (I) value
- Neutral current (IN)
- CosØ values of phases and CosØ value of the system
- Power factor (PF) values of phases and total power factor (PF)
- Active power (P) values of phases and total active power (P) value
- Reactive power (Q) values of phases and total reactive power (Q) value
- Apparent power (S) values of phases and total apparent power (S) value
- Frequency (F) values of phases
- THDV values of phases and total THDV value
- THDI values of phases and total THDI value

3.2.2.2 Energy Menu

This menu includes

- Imported active
- Exported active
- Inductive reactive
- Capacitive reactive

energy values.

When an energy meter reaches the value “50000000.0 Mega”, it will start to count from “0.0”.

3.2.2.2.1 Imp. Active Menu (Imported Active Energy Menu)

Imported active energy values are displayed.

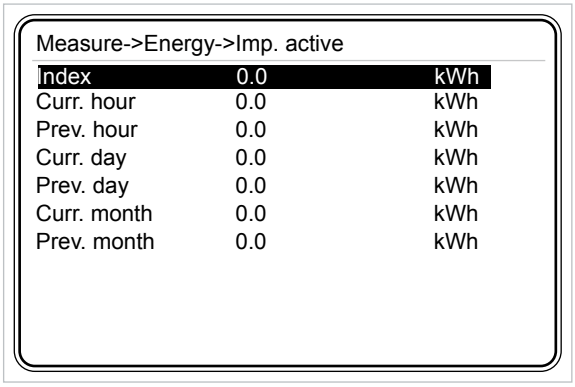


Fig. 3-71 Imp. Active Energy Page

Index

is the imported active energy value from the time when the energy values are cleared to this moment.

Curr. hour

is the imported active energy value from the start of the hour to this moment.

Prev. hour

is the active energy value imported during the previous hour.

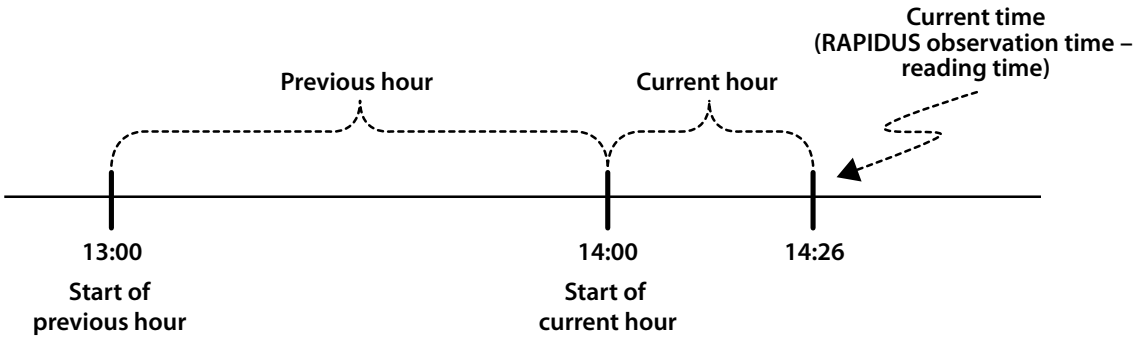


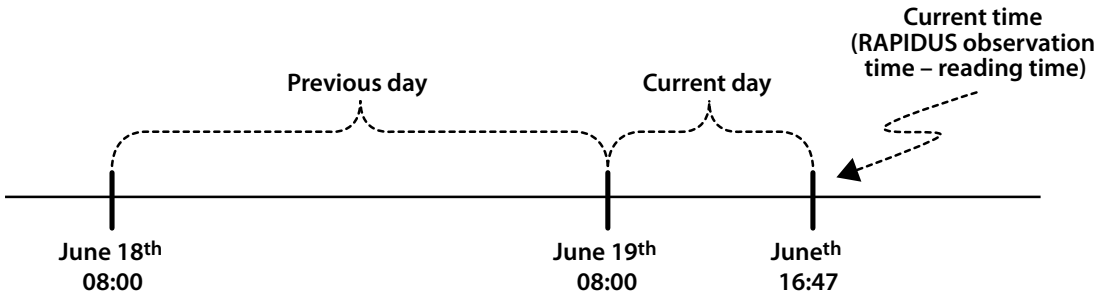
Fig. 3-72 Hour Start Example

Curr. day

is the imported active energy value from the starting hour of the day to this moment.

Prev. day

is the active energy value imported during the previous day.



*Starting hour of the day: 8

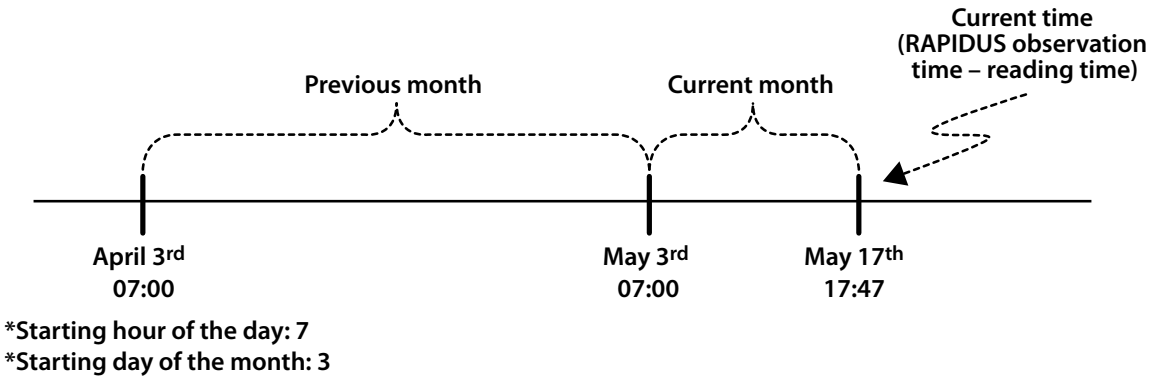
Fig. 3-73 Day Start Example

Curr. month

is the imported active energy value from the starting day of the month to this moment.

Prev. month

is the active energy value imported during the previous month.



*Starting hour of the day: 7
*Starting day of the month: 3

Fig. 3-74 Month Start Example

Settings for "start of day" and "start of month" parameters which are important for the usage of energy menu page are performed on "Settings->Setup->Energy" menu.

Example:

Assume that start of the day time is assigned as "0". Then, when the system clock shows 00:00, the value in the "Curr. day" tab shall be recorded in the "prev. day" tab. "Curr. day" shall be reset and starts to count from zero.

Example:

Assume that start of the month day is assigned as "1" and start of the day time is assigned as "0".

Then, when day of the moth is 1, and hour is 00:00, the value in the "Curr. month" tab shall be recorded in the "prev. month" tab. "Curr. month" shall be reset and starts to count from zero.

3.2.2.2.2 Exp. Active Menu (Exported Active Energy Menu)

The explanations for "Exp. active" menu are the same as 3.2.2.2.1 (Measure->Energy->Imp. Active) energy menu.

3.2.2.2.3 Ind. Reactive Menu (Inductive Reactive Energy Menu)

The explanations for "Ind. reactive" menu are the same as 3.2.2.2.1 (Measure->Energy->Imp. Active) energy menu.

3.2.2.2.4 Cap. Reactive Menu (Capacitive Reactive Energy Menu)

The explanations for "Cap. reactive" menu are the same as 3.2.2.2.1 (Measure->Energy->Imp. Active) energy menu.

3.2.2.3 Demand Menu

Highest values of the averages occurred in the currents and powers during the set demand period are displayed on the demand menu. Demand values are recorded with time information. On the demand sub menus, current and power values and sum of these values are shown for each phase.

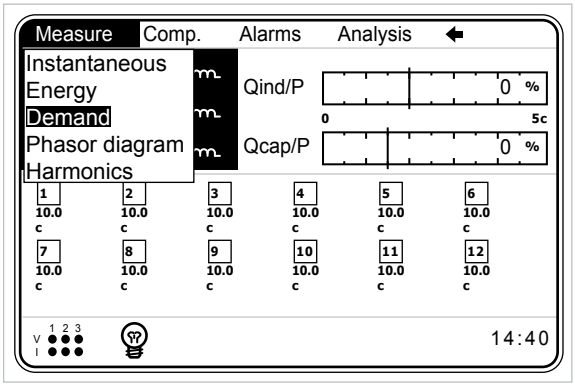
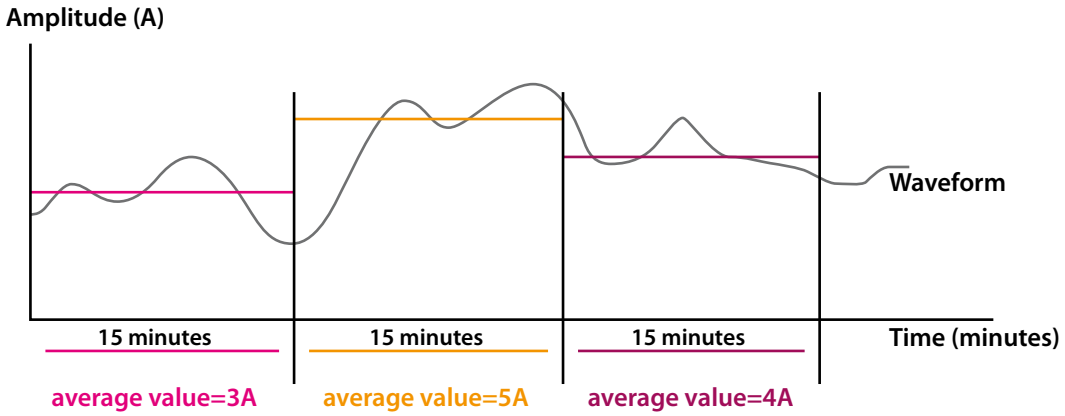


Fig. 3-75 Demand Menu

Example:

Current signal averages and demand value for 15 minutes demand period are shown in the following graphic.



average value=3A average value=5A average value=4A

demand period=15 minutes

Fig. 3-76 Demand Example

3.2.2.3.1 Current Menu

Demand values for each phase current and the demand value for the sum of the phase currents are shown. Bottom tab of the demand values indicate the date and time they have occurred.

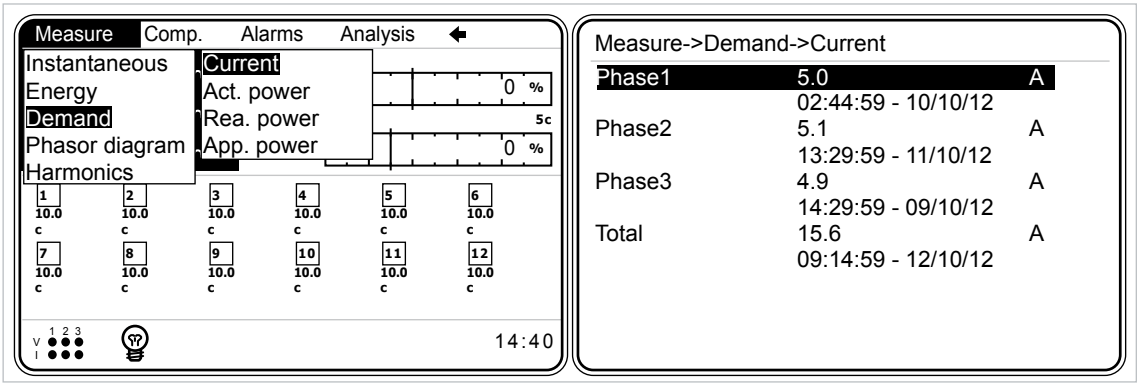


Fig. 3-77 Current Menu

Example:

Assume that the demand period is entered as 15 minutes and current value demand value and time are read as Phase1 5.0 A 02:44:59 - 10/10/13. Then, the description for the value read is as follows:

On October 10th, 2013, at 02:29:59 and 02:44:59 period, demand value for 1st phase is 5.0 A.

Example:

Demand periods when the demand period is set as 15 minutes when system clock is 15:07:00 are shown below:

05:07:00 - 15:14:59 = 1st demand period
15:14:59 - 15:29:59 = 2nd demand period
15:29:59 - 15:44:59 = 3rd demand period
15:44:59 - 15:59:59 = 4th demand period
15:59:59 - 16:14:59 = 5th demand period
.
.
.

3.2.2.3.1.1 Act. Power Menu

Demand values in the active power sub menu are as described in "Measure->Demand->Current" sub menu.

3.2.2.3.1.2 Rea. Power Menu

Demand values in the reactive power sub menu are as described in "Measure->Demand->Current" sub menu.

3.2.2.3.1.3 App. Power Menu

Demand values in the apparent power sub menu are as described in "Measure->Demand->Current" sub menu.

3.2.2.4 Phasor diagram Menu

Following information are listed on the right side of the diagram on phasor diagram menu screen.

- voltage values for phases
- current values for phases
- Angle values between V1-V2, V2-V3 and V3-V1
- Angle values between V1-I1, V2-I2 and V3-I31

On the phasor diagram, current lines are displayed as gray and voltage lines are displayed as black.

In order to follow the currents and voltages pertaining to the same phase more easily in phasor diagram, circles with the same size are added to the ends of the lines pertaining to the same phase.

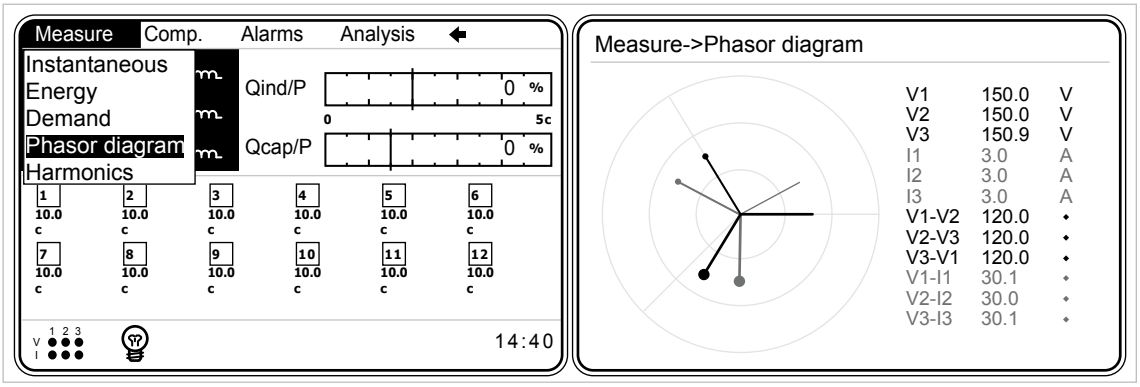


Fig. 3-78 Phasor Diagram Menu

3.2.2.5 Harmonics Menu

RAPIDUS measures/calculates current and voltage harmonics up to 51st level. Current and voltage harmonics are displayed both in tabular and graphic form.

3.2.2.5.1 Table Menu

Current and voltage harmonics pertaining to each phase are displayed in tabular form in this menu (See Fig. 3-77). User may navigate between tables by pressing right and left arrows.
There are 6 table pages. V1, V2, V3, I1, I2, I3.

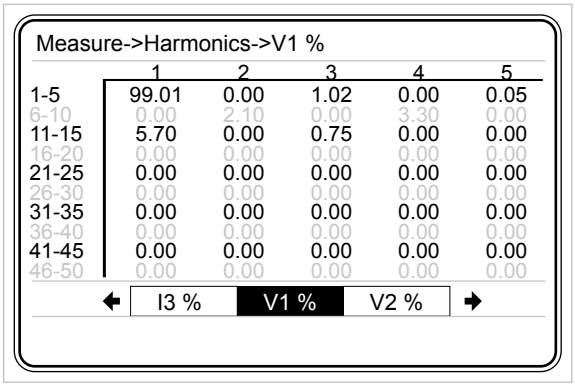


Fig. 3-79 Harmonics Table Menu

3.2.2.5.2 Graphic Menu

Current and voltage harmonics pertaining to each phase are displayed in graphic form in this menu (See Fig. 3-78). User may navigate between current-voltage graphics by pressing right and left arrows. There are 6 graphic pages: V1, V2, V3, I1, I2, I3.

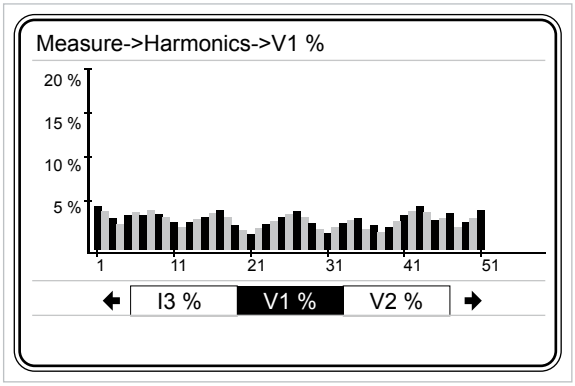


Fig. 3-80 Graphic Menu

3.2.3 Comp. (Compensation) Menu

Sub menus shown in Fig. 3-79 are available.

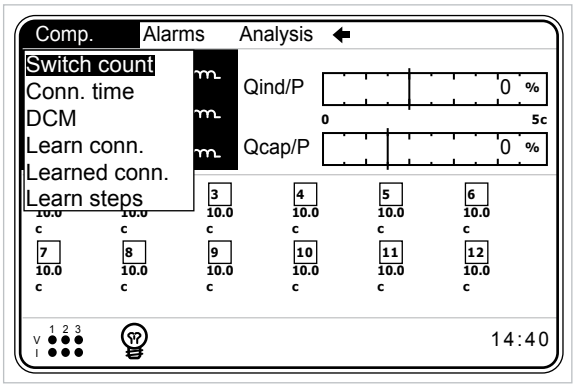


Fig. 3-81 Comp. Menu

3.2.3.1 Switch Count Menu

This menu displays how many times RAPIDUS activated each step.

In order to clear/change switching counts, highlight the desired step and press OK. Switch count is set between 0 and 10000. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

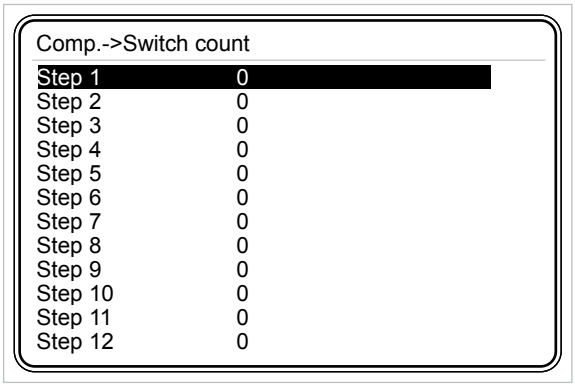


Fig. 3-82 Switch Count

3.2.3.2 Conn. Time Menu

Connection times of the steps are displayed.

In order to clear/change connection times, highlight the desired step and press OK. Conn. time is set between 0 and 1000000. (For the usage of RAPIDUS Virtual Keyboard, Refer to 3.1.4 Ex.).

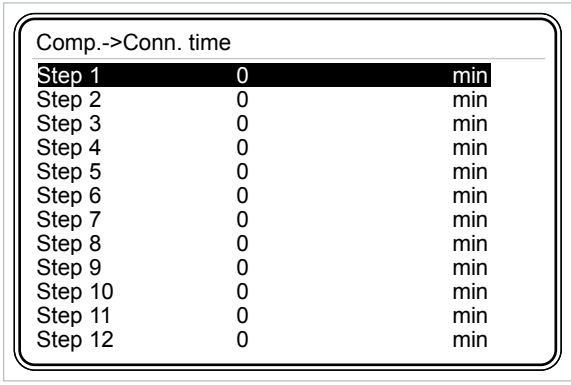


Fig. 3-83 Conn. Time

3.2.3.3 DCM (Dynamic Capacitor Monitoring)

Step values learned by dynamic monitoring can be followed from this menu. These are observed after a certain amount of time due to the effects and nature of DCM algorithm.

There is no compensation program with a prerequisite for DCM. DCM shall estimate step powers in each compensation program.

First estimation results require at least 128x8 compensation switching. Estimation values shall be updated at every 128 compensation switching after that. Previous estimation power is the entered or learned step power values.

3.2.3.4 Learn Conn. Menu

Connections of current and voltage measurement inputs are learned.

RAPIDUS learns the connections by activating a 3-phase capacitor. Relevant capacitor is determined with the "Step number" tab on the 'Quick Setup' or 'Settings->Setup->Learn->Learn Conn.' menu.

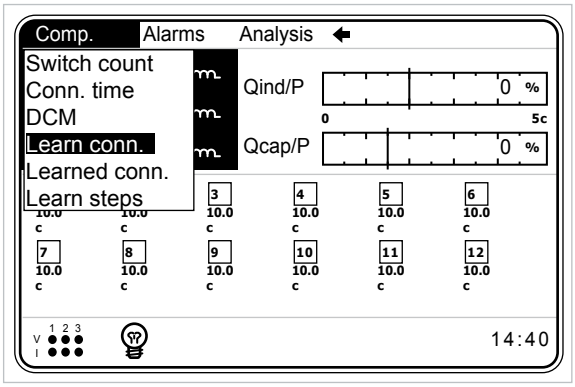


Fig. 3-84 Learn Conn.

On the "Step number" setting, the step number that the capacitor with the highest power value is connected shall be entered.

3.2.3.5 Learned Conn. Menu

Connections learned by RAPIDUS are displayed.

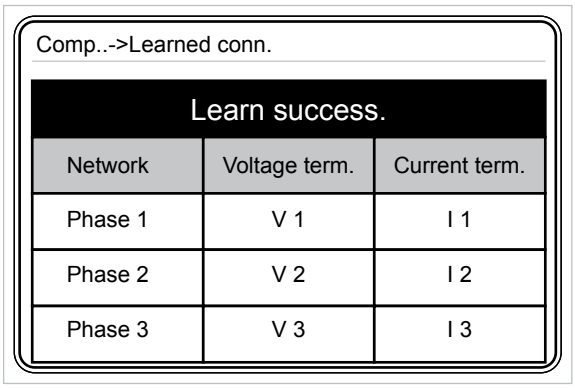


Fig. 3-85 Learned Conn.

3.2.3.6 Learn Steps Menu

RAPIDUS learns the power and type of capacitors or shunt reactors connected to its steps by activating them in order.

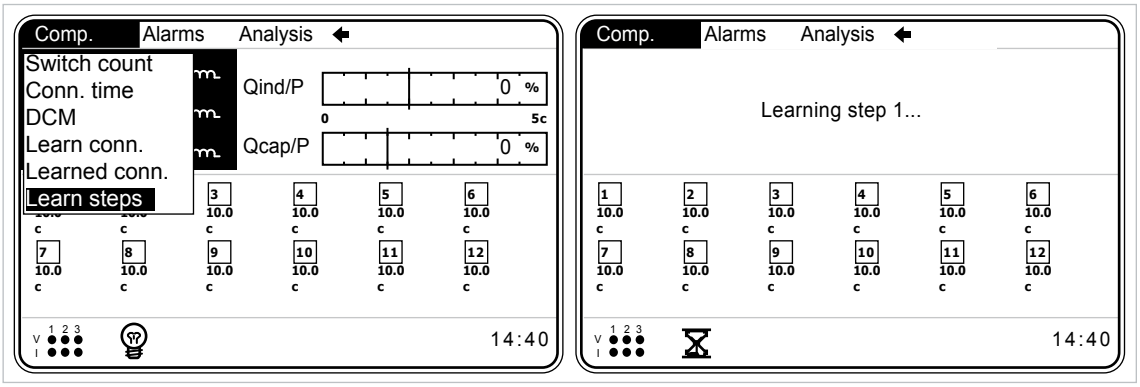


Fig. 3-86 Learn Steps

No load (current amplitude and cosØ) changes shall occur in the system to ensure that step powers are learned correctly. Otherwise, RAPIDUS may learn step powers and step types incorrectly.

3.2.4 Alarms Menu

RAPIDUS alarms may be monitored from alarms menu. Sub menus are Phase1, Phase2, Phase3, Step and Other.

A total of 50 alarm conditions with their times are recorded on the RAPIDUS MODBUS table. When the number of alarm conditions exceed 50, last occurring alarm conditions is written over the 1st alarm.

On the MODBUS table, the descriptions for the variables related with the alarm conditions are as follows:

Alarm Timestamp : Carries alarm time information. It has 32 bit int. data structure.
Alarm Description : This is the bit number on the alarm tags. Thus, user may match the relevant bit on the alarm tag and the alarm. Refer to the example.
Alarm Status : Indicates alarm entry or alarm exit status. Both alarm entry and alarm exit are events for RAPIDUS. Both are recorded in MODBUS table.
1 -> Alarm entry
0 -> Alarm exit
Alarm Value : Current value of the parameter related with the alarm
For more details, refer to Modbus document.

Example:

Assume 100 VAC is entered as the low limit value for phase1, phase2 and phase3 voltages and phase3 voltage has gone under 100VAC in the system. In this case,

Alarm Description is the index number of the relevant alarm bit in the alarm tags. Thus, for the condition above, "alarm description value" shall be 3.

Briefly, you can use the number under this heading as an index in the alarm tags to reach the description of alarm. Moreover, user matches the alarm and alarm tag.

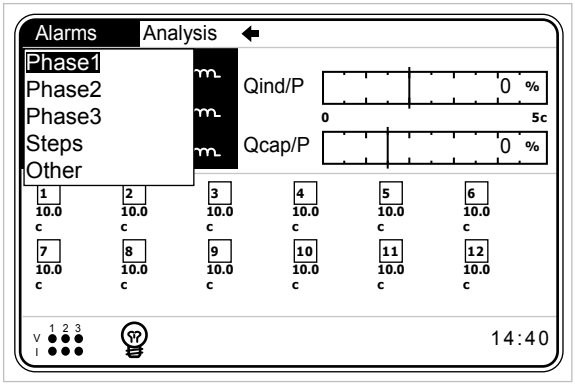


Fig. 3-87 Alarms Menu

3.2.4.1 Phase1 Menu

Statuses of alarms pertaining to 1st phase are shown in Phase1 menu.
"Normal" → NO Alarm
"Alarm" → Alarm AVAILABLE

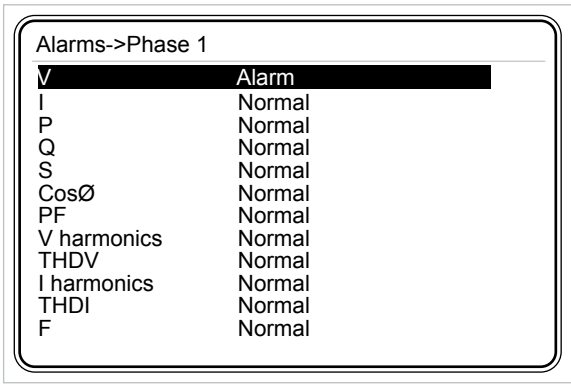


Fig. 3-88 Phase1 Menu

Following alarm statuses are monitored in Phase1 menu.

- V (phase-neutral voltage)
- I (current)
- P (active power)
- Q (reactive power)
- S (apparent power)
- CosØ
- PF (power factor)
- V harmonics (up to 21st voltage harmonics)
- THDV voltage (total harmonics distortion in the voltage)

- I harmonics (up to 21st current harmonics)
- THDI (total harmonics distortion in the current)
- F (frequency)

3.2.4.2 Phase2 Menu

Phase2 menu descriptions are the same as the Phase1 menu descriptions.

3.2.4.3 Phase3 Menu

Phase3 menu descriptions are the same as the Phase1 menu descriptions.

3.2.4.4 Step Menu

Descriptions of Normal and Alarm warnings are the same as Phase1 menu in "Step" menu.

RAPIDUS gives an alarm when any of the steps used in compensation gets lower than the value calculated with the "low limit" setting (alarm limit).

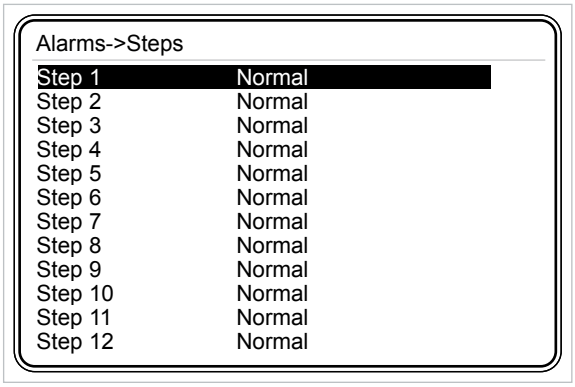


Fig. 3-89 Step Menu

3.2.4.5 Other Menu

Descriptions of Normal and Alarm warnings are the same as Phase1 menu in "Other" menu.

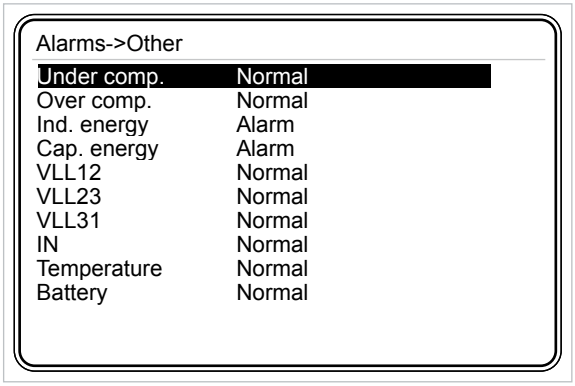


Fig. 3-90 Other Menu

Following alarm statuses are observed in “Other” menu.

- Under comp.
- Over comp.
- Ind. energy
- Cap. energy
- VLL12 (phase1-phase2 voltage)
- VLL23 (phase2-phase3 voltage)
- VLL31 (phase3-phase1 voltage)
- IN (Neutral current)
- Temperature
- Battery

When the battery voltage is less than 1.9 V, RAPIDUS gives a battery alarm. When RAPIDUS gives a battery alarm, please contact the authorized dealer you have purchased the device (or nearest authorized dealer).

3.2.5 Analysis Menu

This menu contains sub menus shown in Fig. 3-88.
Analysis menu parameters can be read from MODBUS table.

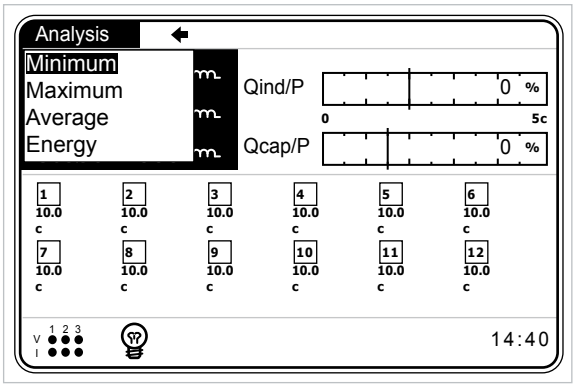


Fig. 3-91 Analysis Menu

Analysis menu parameters are not stored in nonvolatile memory. Therefore, all parameters pertaining to analysis menu are reset when the device is reset.

3.2.5.1 Minimum Menu

This menu includes hourly, daily and monthly minimum values.

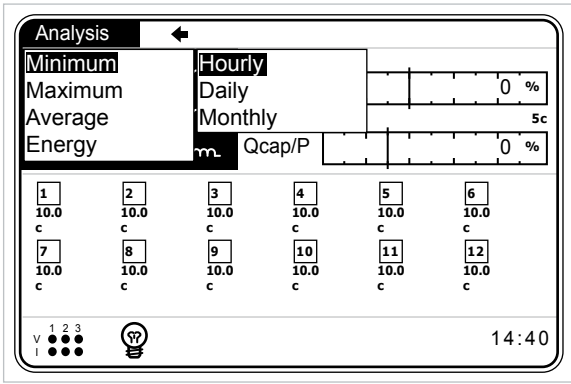


Fig. 3-92 Minimum Menu

3.2.5.1.1 Hourly Menu

This menu includes minimum 'instantaneous' values measured from the start of the hour to current time.

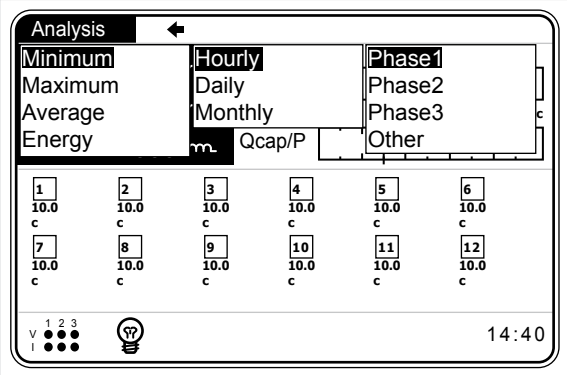


Fig. 3-93 Hourly Menu

3.2.5.1.1.1 Phase1 Menu

Voltage (V), current (I), active power (P), reactive power (Q), apparent power (S), cosØ, power factor (PF) and frequency (F) values are displayed.

3.2.5.1.1.2 Phase2 Menu

Voltage (V), current (I), active power (P), reactive power (Q), apparent power (S), cosØ, power factor (PF) and frequency (F) values are displayed.

3.2.5.1.1.3 Phase3 Menu

Voltage (V), current (I), active power (P), reactive power (Q), apparent power (S), cosØ, power factor (PF) and frequency (F) values are displayed.

3.2.5.1.1.4 Other

VLL12 (phase1-phase2 voltage), VLL23 (phase2-phase3 voltage), VLL31 (phase3-phase1 voltage)

3.2.5.1.2 Daily Menu

This menu includes minimum “instantaneous” values measured from the starting hour of the day (Refer to 3.2.1.2.6.1) to current time. Descriptions of sub menus are the same as the hourly menu.

3.2.5.1.3 Monthly Menu

This menu includes minimum “instantaneous” values measured from the starting day of the month (Refer to 3.2.1.2.6.2) and starting hour of the day (Refer to 3.2.1.2.6.1) to current time. Descriptions of sub menus are the same as the hourly menu.

3.2.5.2 Maximum Menu

Sub menus and descriptions of the sub menus of the “Maximum” menu are the same as “Minimum” menu. Values measured in “Maximum” menu are also “instantaneous” maximum values.

3.2.5.3 Average Menu

Sub menus and descriptions of the sub menus of the “Average” menu are the same as “Maximum” menu. “Average” menu displays the “average” values taken in hourly, daily and monthly periods.

3.2.5.4 Energy Menu

This menu includes hourly, daily and monthly counter values.

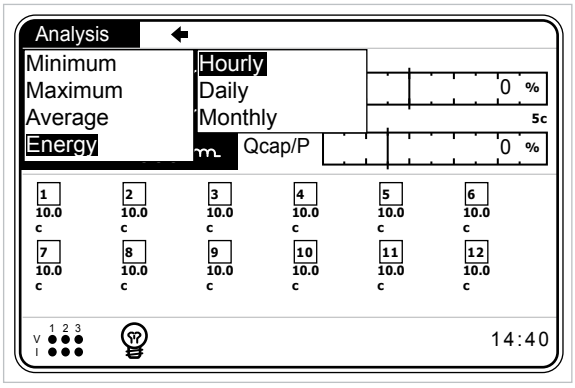


Fig. 3-94 Energy Menu

3.2.5.4.1 Hourly Menu

This menu includes counter values measured from the start of the hour to current time.

kWh (imp. active), kWh E. (exp. active), kVArh I (inductive reactive), kVArh C. (capacitive reactive) counter values are displayed.

3.2.5.4.2 Daily Menu

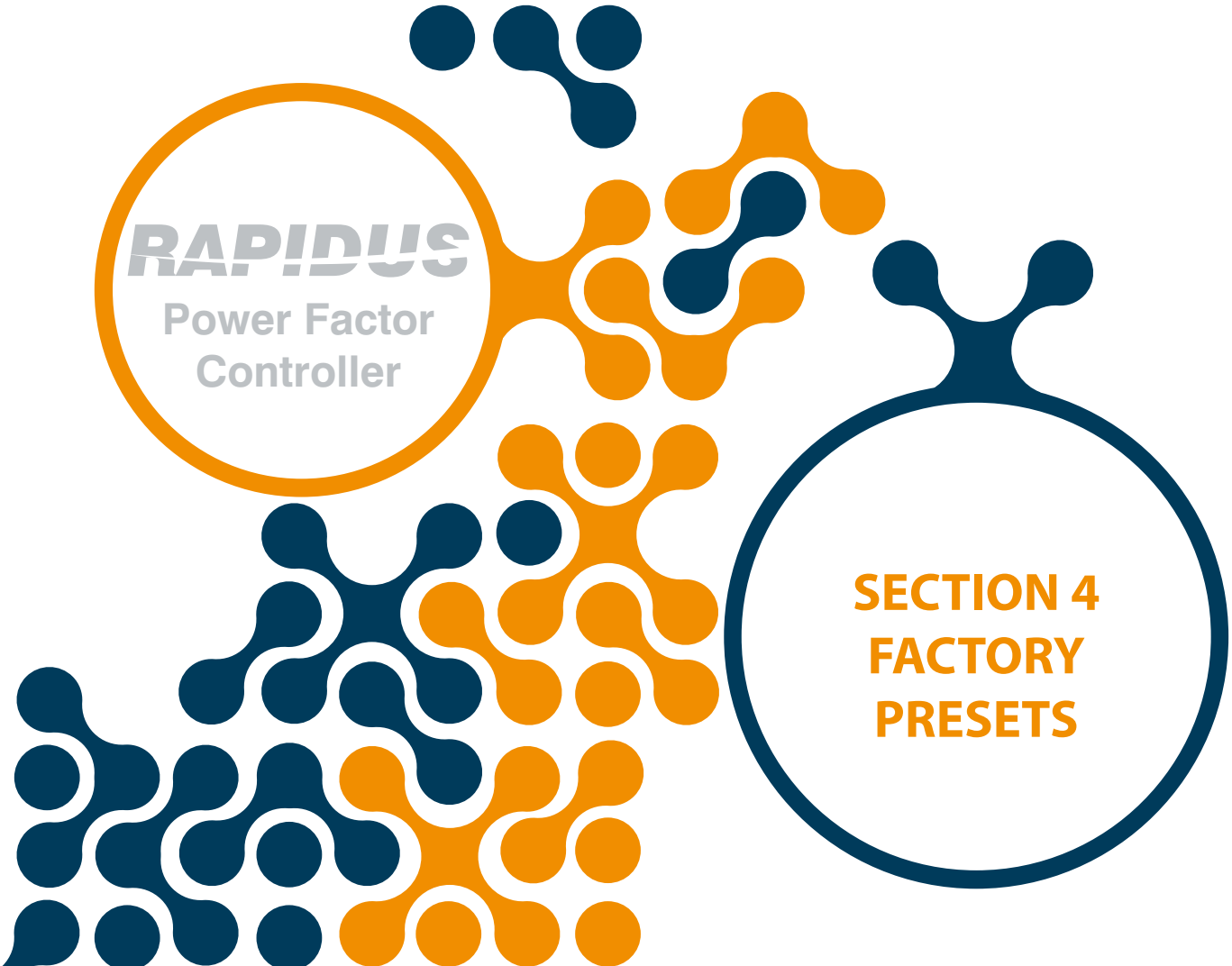
This menu includes counter values measured from the starting hour of the day (Refer to3.2.1.2.6.1) to current time.

kWh (imp. active), kWh E. (exp. active), kVArh I (inductive reactive), kVArh C. (capacitive reactive) counter values are displayed.

3.2.5.4.3 Monthly Menu

This menu includes counter values measured from the starting day of the month (Refer to. 3.2.1.2.6.2) and starting hour of the day (Refer to 3.2.1.2.6.1) to current time.

kWh (imp. active), kWh E. (exp. active), kVArh I (inductive reactive), kVArh C. (capacitive reactive) counter values are displayed.


RAPIDUS
Power Factor
Controller
SECTION 4
FACTORY
PRESETS

SECTION 4 FACTORY PRESETS

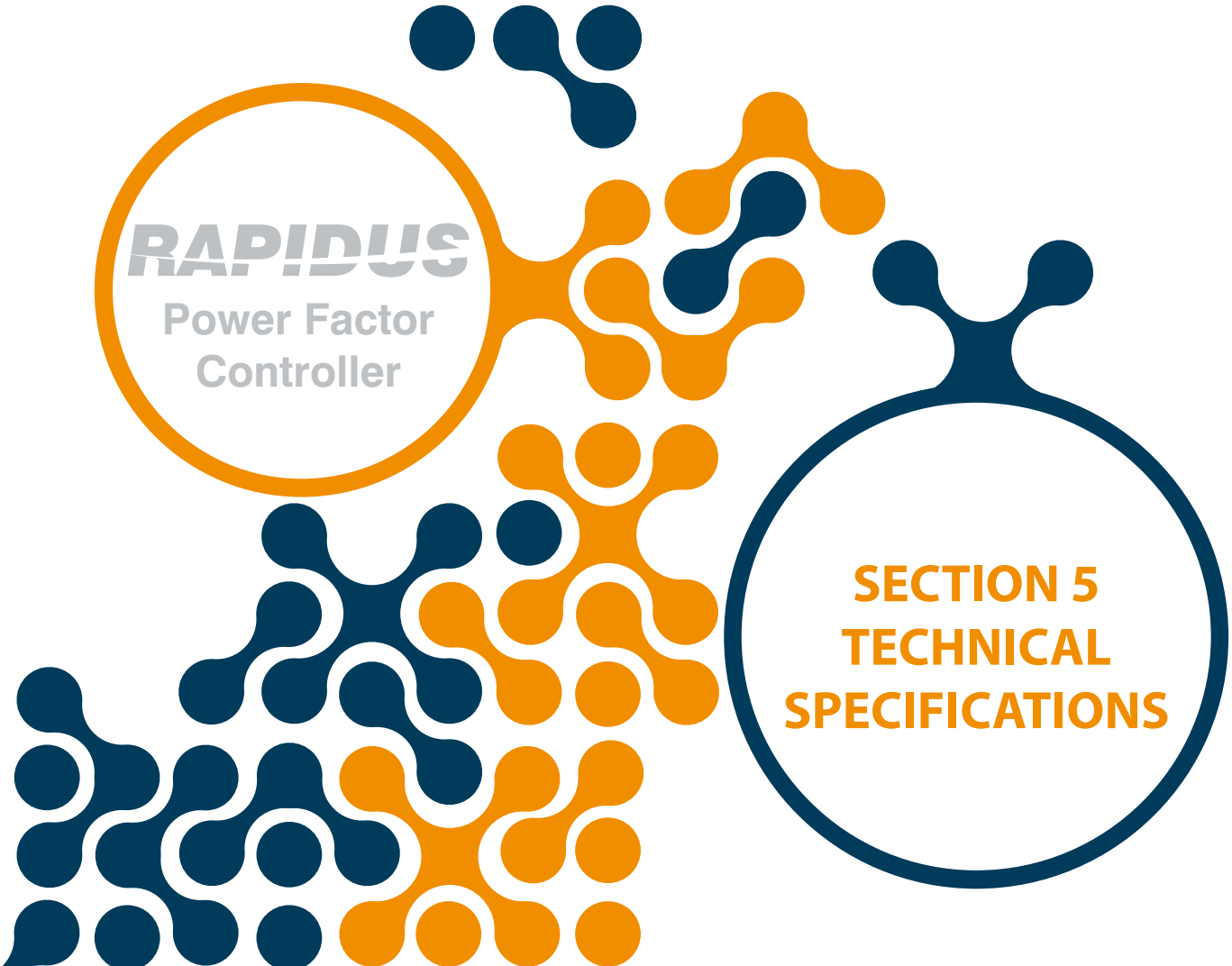
	Factory Presets	Unit	Setting Values
Network Settings			
CTR	1	-	1↔5000
VTR	1	-	1.0↔5000.0
Demand Period	15	min	1↔60
Step Settings			
Ent. Power	10	kVAr	0.00↔1000.00
Ent. Type	C	-	C, C1, C2, C3, L, L1, L2, L3
Predefined Structure	1-1-1-1	-	1-1-1-1, 1-1-2-2, 1-2-2-4, 1-2-3-3, 1-2-4-4, 1-1-2-4, 1-2-3-4, 1-2-4-8, 1-1-2-3
Predefined Power	10	kVar	0.00↔1000.00
Number of Predefined Steps	12	-	1↔12
Discharge Time	15	s	3↔1000
Compensation Settings			
Steps	Entered	-	Entered, Predefined
Program	Rapidus	-	Rapidus, Ascending Sequential, Descending Sequential, Linear, Circular, Manual
Target 1 Ind.	1.000	-	0.800↔1.000
Target 1 Cap.	1.000	-	0.800↔1.000
Target 2 Ind.	1.000	-	0.800↔1.000
Target 2 Cap.	1.000	-	0.800↔1.000
Activation Time	10	s	1↔500
Deactivation Time	10	s	1↔500
Shift Angle	0.00	°	-45.00 °↔45.00 °

	Factory Presets	Unit	Setting Values
Averaging Time	Off	s	Off, 5 s, 10 s, 20 s, 30 s, 40 s, 50 s, 60 s
Fixed Steps	N/A	-	N/A, Step 1, Step 1 and 2, Step 1,2 and 3
Learn Settings			
Connection	Off	-	Off, On
Step number	1	-	1↔12
Retry Time	5	min	5↔60
Retry Number	3	-	1↔20
Learn Step	Off	-	Off, On
Digital Input Settings			
Mode	Off	-	Off, Night/Day, Generator
Device Settings			
Language	English	-	İngilizce, Türkçe, Русский
Contrast	Level 0	-	Level 4↔Level -4
Pass. Protection	On	-	Off, On
New Password	1	-	1↔9999
Display On	Time Dependent	-	Time Dependent, Continuous
Display On Time	600	s	10↔600
Energy Settings			
Start of Day	0	h	0↔23
Start of Month	1		1↔28
kWh	1000000.000	kWh	0.0↔20000000000.0
kWh E.	1000000.000	kWh	0.0↔20000000000.0
kVArh I.	1000000.000	kVArh	0.0↔20000000000.0
kVArh C.	1000000.000	kVArh	0.0↔20000000000.0
Communication Settings			
Baud Rate	38400	bps	2400, 4800, 9600, 19200, 38400, 57600
Slave Id	1	-	1↔247
Alarm Settings			

	Factory Presets	Unit	Setting Values
Energy			
Inductive Hi Limit	20.0	%	0.0↔40.0
Alarm Relay	Off	-	Off, Relay1, Relay2
Capacitive Hi Limit	15.0	%	0.0↔40.0
Alarm Relay	Off	-	Off, Relay1, Relay2
V (L-N)			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	V	0.0↔1500000
High Limit	0.0	V	0.0↔1500000
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
V (L-L)			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	V	0.0↔2600000
High Limit	0.0	V	0.0↔2600000
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
Current, IN			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	A	0.0↔30000.0
High Limit	0.0	A	0.0↔30000.0
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
P			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	W	-1000000000.0↔10000000000.0
High Limit	0.0	W	-1000000000.0↔10000000000.0
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
Q			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	VAr	-1000000000.0↔10000000000.0
High Limit	0.0	VAr	-1000000000.0↔10000000000.0
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20

	Factory Presets	Unit	Setting Values
S			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	VA	0.0↔10000000000.0
High Limit	0.0	VA	0.0↔10000000000.0
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
CosØ, PF			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.000	-	0.000↔1.000
High Limit	0.000	-	0.000↔1.000
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
Step			
Low Limit	20.0	-	20.0↔100.0
F			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	50.0	Hz	35.0↔70.0
High Limit	50.0	Hz	35.0↔70.0
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20
Harmonics V			
Alarm Relay	Off	-	Off, Relay1, Relay2
THDV Hi Limit	0.0	%	0.0↔100.0
V3 Hi Limit	0.0	%	0.0↔100.0
V5 Hi Limit	0.0	%	0.0↔100.0
V7 Hi Limit	0.0	%	0.0↔100.0
V9 Hi Limit	0.0	%	0.0↔100.0
V11 Hi Limit	0.0	%	0.0↔100.0
V13 Hi Limit	0.0	%	0.0↔100.0
V15 Hi Limit	0.0	%	0.0↔100.0
V17 Hi Limit	0.0	%	0.0↔100.0
V19 Hi Limit	0.0	%	0.0↔100.0
V21 Hi Limit	0.0	%	0.0↔100.0
Harmonics I			
Alarm Relay	Off	-	Off, Relay1, Relay2
THDI Hi Limit	0.0	%	0.0↔100.0
I3 Hi Limit	0.0	%	0.0↔100.0

	Factory Presets	Unit	Setting Values
I5 Hi Limit	0.0	%	0.0↔100.0
I7 Hi Limit	0.0	%	0.0↔100.0
I9 Hi Limit	0.0	%	0.0↔100.0
I11 Hi Limit	0.0	%	0.0↔100.0
I13 Hi Limit	0.0	%	0.0↔100.0
I15 Hi Limit	0.0	%	0.0↔100.0
I17 Hi Limit	0.0	%	0.0↔100.0
I19 Hi Limit	0.0	%	0.0↔100.0
I21 Hi Limit	0.0	%	0.0↔100.0
Temperature			
Alarm Relay	Off	-	Off, Relay1, Relay2
Low Limit	0.0	°C	-20.0 °C↔80.0 °C
High Limit	0.0	°C	-20.0 °C↔80.0 °C
Delay	0	s	0↔600
Hysteresis	0.0	%	0.0↔20.0


RAPIDUS
Power Factor
Controller
SECTION 5
TECHNICAL
SPECIFICATIONS

SECTION 5 TECHNICAL SPECIFICATIONS

Supply

Voltage ..... 85..300V AC/DC
Frequency ..... 45..65 Hz

Measurement Inputs

Voltage ..... 85..300 V RMS (L-N)
Current ..... 0.01..6 A RMS
Frequency ..... 45..65 Hz
Night/Day Input ..... 85..265VAC RMS

Measurement Sensitivity

Current ..... ≤0.3%
Voltage ..... ≤0.3%
Active Power ..... ≤0.5%
Reactive Power ..... ≤0.5%
Apparent Power ..... ≤0.5%
Phase-Neutral voltage ..... ≤0.3%
CosØ ..... ≤0.3%
Frequency ..... ≤0.1%

Relay outputs

14 pcs,
Max. switching current ..... : 5A
Max. switching voltage ..... : 250 VAC
Max. switching power ..... : 1250VA

Number of Steps

Can be selected between 1 and 12.

Target CosØ Interval

0.800-1.000 (ind.-cap.) can be selected with 0.001 steps.

CTR

Can be set 1..5000.

VTR

Can be set 1..5000.

Demand Period

Can be set 1 to 60 minutes.

User Interface

Keypad ..... : 6 keys with ESD protection
LCD ..... : Self-illuminated 160 x 240 graphic

Communication

Isolated RS485 Port.....:1 Channel, ESD and over current/voltage protected, programmable, 2400bps to 57600 bps baud rate. 2000VRMS isolation.

Operating Temperature

-20°C..+70°C

Storage Temperature

-30°C..+80°C

Relative Humidity

Maximum 90%

Dimensions

W144 x H144 x D78

Protection class

IP40

Power Consumption

<10VA

Klemsan®

www.klemsan.com.tr